DOCUMENT RESUME

ED 138 646 95 TM 006 303

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TITLE Mastery Learning and Mastery Testing: An Annotated ERIC Bibliography.
INSTITUTION ERIC Clearinghouse on Tests, Measurement, and Evaluation, Princeton, N.J.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE Feb 77
CONTRACT 400-75-0015
NOTE 65p.

EDRS PRICE MF-$0.83 HC-$3.50 Plus Postage.
DESCRIPTORS *Annotated Bibliographies; *Mastery Learning; *Mastery Tests

ABSTRACT

This 136-item annotated bibliography on mastery learning and mastery testing is the result of a computer search of the ERIC data base in February 1977. All entries are listed alphabetically by author. An abstract or annotation is provided for each entry. A subject index is included reflecting the major emphasis of each citation. (RC)

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MASTERY LEARNING AND TESTING

AN ANNOTATED ERIC BIBLIOGRAPHY

Compiled by

Barbara M. Wildemuth

February 1977

ERIC CLEARINGHOUSE ON TESTS, MEASUREMENT, AND EVALUATION
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PREFACE

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Besides processing documents and journal articles, the Clearinghouse has another major function: information analysis and synthesis. The Clearinghouse prepares bibliographies, literature reviews, state-of-the-art papers, and other intepretive reports on topics in its area of interest.

ABOUT THE BIBLIOGRAPHY

The descriptors "Mastery Learning" and "Mastery Tests" were added to the ERIC Thesaurus in December 1976. This bibliography was compiled to bring together the relevant literature included in the ERIC data base before that time. A computer search of the ERIC data base in February 1977 yielded documents announced in Resources in Education and journal articles indexed in Current Index to Journals in Education which covers over 700 education-related journals. ERIC began collecting information for RIE in 1966 and for CIJE in 1969.

For ERIC documents (those with an ED number appearing at the end of the bibliographic citation) the following information is presented when available; Personal author, title, date of publication, number of pages, and ED number. These documents may be purchased in hard copy or in microfiche from the ERIC Document Reproduction Service (EDRS). Price information and an order form are appended. However, ERIC microfiche collections are available at approximately 590 locations throughout the country, and most of these collections are open to the public. If you are unable to find a collection in your area, you may write ERIC/TM for a listing.

Journal articles (those entries appearing with an EJ number) are not available from EDRS. However, most of these journals are readily available in college and university libraries as well as some large public libraries.

All entries are listed alphabetically by author and are numbered. An abstract, or in the case of most journal articles, a shorter annotation, is provided for each entry. A subject index consisting of ERIC descriptors and identifiers reflecting major emphasis is also provided. Numbers appearing in the index refer to entries.

1. Adams, E.N. On Scoring a Mastery Learning System Control Test. Journal of Computer-Based Instruction, Vol. 1, No. 2, November 1974, pages 50-58. EJ 112 928.

   The state of learning of a student is modelled as M or N, to agree with the outcomes Mastery and Non-Mastery made on a control test. The quality of the test item is characterized by two error parameters equal to the probabilities of errors of testing. A scoring algorithm is specified based on the probabilistic theory of inference. A bootstrap system for determining error parameters is described, capable of providing continuously improving estimates of error parameters from analysis of individual learner performance data, and it is shown to converge to true values of the parameters in a system for which the underlying model is valid. The possible application of the ideas to control test scoring is discussed.

2. Aims, Doug. A Markov Model for Predicting Performance on Criterion-Referenced Tests. Los Alamitos, California: Southwest Regional Laboratory for Education Research and Development, June 1971. 15 pages. ED 111 847.

   A Markov model for predicting performance on criterion-referenced tests is presented. The model is expressed mathematically as a function of transition matrix, a current state vector, and a future state vector. The matrix is defined in terms of conditional probabilities, i.e., the probability of making a transition to a specific future performance state given data pertaining to the student's current performance state. Performance is expressed in terms of mastery, a theoretical construct that is defined in the paper. State vectors indicate either the probability of mastery or the degree of mastery. The current state vector can be computed from available observed criterion test scores. Three examples are included which indicate how transition matrices may be computed. An example is also provided which shows how the model can be used to predict future performance. Finally, a research application and a management application of the Markov model are mentioned.

3. Airasian, Peter W. An Application of Mastery Learning Strategy. Psychology in the Schools, Vol. 9, No. 2, April 1972, pages 130-133. EJ 057 890.

   Nongraded diagnostic progress tests, individualized remedial procedures, and criterion-referenced grading standards were utilized in an effort to help all students attain final course mastery. The strategy enabled 80 percent of the students in a graduate level Testing Methods course to attain final course mastery.

4. Alvir, Howard P. Applying Mastery Learning in the Classroom. December 197[illegible]. ED 113 352. Not available in hard copy.

This booklet is intended for nursing education teachers, and provides them with the product and process that was successfully used to develop education learning packets. The booklet contains six self-paced modules which aid the student in the assessment of the patient and which have been culled by one teacher from a larger bank of material organized by Computerized Information System for Nursing Education (CISNE). The six modules are (1) Principles of Observation, (2) the Physical Examination, (3) Diagnostic Tests, (4) Vital Signs, (5) Blood Pressure, and (6) Recording and Reporting. Each of these six modules includes a stated purpose, a vocabulary list, behavioral objectives, evaluation guidelines, and a study guide. Provisions are made for student evaluation in each module.

5. Andersen, Hans O. Science Teaching - A Tangled Web. Australian Science Teachers Journal, Vol. 21, No. 3, November 1975, pages 61-70. EJ 139 857.

Briefly tracing the history of science curriculum development in the United States, learning contracts and mastery learning are explained as two techniques for humanizing science instruction. The main objectives for science teaching, the rationales, and the claims that must be satisfied are summarized.

6. Anderson, Lorin W. An Empirical Investigation of Individual Differences in Time to Learn. Journal of Educational Psychology, Vol. 68, No. 2, April 1976, pages 226-233. EJ 142 034

Results show that student differences in time-on-task to learn to criterion are alterable and can be minimized over a sequence of learning units given appropriate adaptive learning strategies.

7. Anderson, Lorin W. Student Involvement in Learning and School Achievement. Paper presented at the annual meeting of the American Educational Research Association (Chicago, Illinois, April 15-19, 1974). 28 pages. ED 090 456

The purpose of the study was to investigate the relationship between selected student characteristics, student involvement in learning, and achievement. Both naturalistic and experimental studies were conducted. In the experimental study, two classes (n = 29, 26) learned a sequence

of matrix arithmetic by mastery learning strategies. The third class (n = 27) learned by more conventional strategies. A significant positive relationship was found to exist between student involvement and selected student and environmental characteristics in both studies. On the final unit, the mastery learning classes scored significantly higher than the conventional class on both student involvement in learning and achievement (p less than .001).

8. Anderson, Lorin W. Time to Criterion: An Experimental Study. Paper presented at the annual meeting of the American Educational Research Association (Washington, D.C., March 30 - April 3, 1975). 19 pages. ED 108 006.

The purpose of the study was to investigate the magnitude of individual differences in time-to-criterion and the stability of these differences. Time-to-criterion was defined in two ways: the amount of elapsed time required to attain the criterion level and the amount of on-task time required to attain the criterion level. Ninety students were randomly assigned to either a mastery learning strategy in which all students were helped to attain the 85 percent criterion level or to one of two control classes. All students learned a three-unit sequence of programmed material in matrix arithmetic. The results of the study indicated that time-on-task-to-criterion and elapsed time-to-criterion are alterable to the extent that the ratio of the necessary time-on-to-criterion for the fastest student to the slowest student on the final unit was approximately one to one and two-fifths. Implications for schooling and school learning are discussed.

9. Annarino, Anthony. Mastery Learning in Physical Education. Paper presented at the annual meeting of the American Alliance for Health, Physical Education and Recreation (Milwaukee, Wisconsin, April 1976). 13 pages. ED 121 772.

This paper discusses the design of a physical education curriculum to be used in advanced secondary physical education programs and in university basic instructional programs; the design is based on the premise of mastery learning and employs programmed instructional techniques. The effective implementation of a mastery learning model necessitates changes in traditional developmental procedures, instructional strategies, and curriculum design. Changes in developmental procedures must include development of psychomotor and cognitive criterion-reference competencies for every learning unit, identification of competencies to be measured for formative and summative evaluation, design of individualized instructional materials for each learning unit

consisting of a systematic and progressive series of psychomotor and cognitive tasks and selection of psychomotor and cognitive tests for pre-entry assessment, formative evaluation, and summative evaluation. Changes in instructional strategies and curriculum design primarily involve providing thorough orientation for students and instructors, setting objectives, and evaluating the system. The number and types of activities, the proficiency levels, and the evaluation procedures are determined by the philosophy and objectives of a school and department. (Included are two program designs which would permit the implementation of mastery learning instructional strategies.)

10. Bassett, Ronald E., and Kibler, Robert J. Effect of Training in the Use of Behavioral Objectives on Student Performance in a Mastery Learning Course in Speech Communication. Paper presented at the annual meeting of the International Communication Association (New Orleans, Louisiana, April 17-20, 1974). 10 pages. ED 094 426.

Supplying explicit statements of instructional objectives to learners is an integral aspect of mastery learning models of instruction. The purposes of this study were to develop a valid procedure for teaching students to use behavioral objectives and to determine minimal levels of competence in using objectives. It was hypothesized that when objectives are provided for a unit of instruction, subjects trained to use objectives will score significantly higher on an examination consisting of items matched to the objectives than subjects not trained. The subjects were 159 undergraduate students enrolled in a survey course of human communication theory at Florida State University. The hypothesis was supported by the data, and implications for future research and classroom application were noted.

11. Bedford, C.M., and others. Contingency Contract Teaching (Mastery Learning) in Introductory Educational Psychology. May 1972. 26 pages. ED 071 568.

During 1971-72 of 487 students in 2 Introductory Educational Psychology classes, 123 students chose to take a lecture course and 364 students chose a mastery learning class. Despite constraints on interpretation, it was concluded that in this particular situation students acquired a knowledge of vocabulary, principles and concepts at least as well by mastery learning as by lecture-discussion methods. In addition, even in a class of more than 200, in contrast to lecture procedures, the mastery learning procedures provided for vastly increased one-to-one interaction between the student and instructor. More than 90% of the student respondents to an opinion survey felt that mastery learning

should continue to be offered as an option for this course. Mastery learning students liked the clarity of goals, the chance to work at their own speed in their own time, and the attainment of course credits by means of unit tests with immediate reinforcement. In contrast to lecture students, many mastery learning students expressed self-change in terms of their own learning processes rather than in terms of course content.

12. Beets, Charles. Auto-Tutorial Mastery Learning in Biology, in Proceedings: Annual Illinois Junior College Conference (Chicago, Ilinois, May 11-13, 1972). Springfield: Illinois Junior College Board, May 1972. 69 pages. ED 073 754.

    The mastery learning strategies used in a general biology course at Parkland College are described in detail.

13. Besel, Ronald. A Comparison of Emrick and Adam's Mastery-Learning Test Model with Kriewall's Criterion-Referenced Test Model. Los Alamitos, California: Southwest Regional Laboratory for Educational Resource and Development, April 1971. 17 pages. ED 111 844.

    The assumptions of the Criterion Referenced Test (CRT) Model proposed by Kriewall are compared to those of Emrick and Adam's Mastery-Learning (ML) model. Testing, in the context of instructional management, serves three general purposes: performance evaluation (achievement of objectives), placement (classification of students for instruction), and diagnosis of learning deficiencies. Both of the test models discussed here assess the achievement of objectives; they differ in the types of objectives for which they are best suited. Both test models have potential usefulness for making placement decisions, but only the ML model is likely to be useful in diagnosing learning deficiencies. The applicability of each model for instructional management decisions is discussed.

14. Besel, Ronald. Mastery-Learning Decision Variables. Los Alamitos, California: Southwest Regional Laboratory for Educational Research and Development, August 1971. 24 pages. ED 111 845.

    The Mastery Learning Test Model is extended, and methods for estimating prior probabilities are described. An adjustment matrix is used to transform a probability of mastery measure and empirical methods for estimating adjustment matrix parameters are derived. Adjustment matrices are interpreted as indicators of instructional effectiveness and as evidence of the existence of learning hierarchies. Two decision

variables are considered: probability of mastery for an individual and proportion in mastery for an instructional group. Discussion of the reliability, complexity, and interpretability of these decision variables and their comparison with decision variables from other test models is also included.

15. Besel, Ronald. Using Group Performance to Interpret Individual Responses to Criterion-Referenced Tests. Paper presented at the annual meeting of the American Educational Research Association (New Orleans, Louisiana, February 25-March 1, 1973). 10 pages. ED 076 658.

    The contention that interpretation of a student's performance on a criterion-referenced test should be independent of the performance of his classmates is challenged. The Mastery Learning Test Model, which was developed for analyzing criterion-referenced test data, is described. An estimate of the proportion of students in an instructional group which has achieved the referent objective is usable as a prior probability in interpreting individual responses. Considering instructional group performance enhances estimates of individual performance. Correlational data from a set of test items and a representative population of students are used to estimate the required item parameters.

16. Besel, Ronald. Using Group Performance to Interpret Individual Responses to Criterion-Referenced Tests. Professional Paper 25. Los Alamitos, California: Southwest Regional Laboratory for Educational Research and Development, June 1973. 13 pages. ED 129 910.

    The contention is made that group performance data are useful in the construction and interpretation of criterion-referenced tests. The Mastery Learning Test Model, which was developed for analyzing criterion-referenced tests data, is described. An estimate of the proportion of students in an instructional group having achieved the referent objectives is usable as a prior probability in interpreting individual responses. Considering instructional group performance enhances estimates of individual performance. Correlational data from a set of test items and a representative population of students are used to estimate the required item parameters.

17. Beyer, Barry K., and others. History Teaching Project: A Project to Improve Productivity in Teaching at Carnegie-Mellon University through the Development of Self-Paced Instruction in Undergraduate History. Final Report. Pittsburgh, PA: Carnegie-Mellon University, 1975. 119 pages. ED 121 673.

An experimental, undergraduate African-history course which used self-paced instructional techniques is described and evaluated in this project report. The project was initiated to assess the effectiveness of the Personalized System of Instruction (PSI) in undergraduate history instruction. Thirty-two students from Carnegie-Mellon University participated in the experimental course. In the course students moved at their own paces, using written study guides, taking mastery tests at the end of each unit, and meeting with proctors to evaluate their progress. Large group lectures were used for instructional purposes. Content focused on the history of Africa south of the Sahara and on a specific problem-solving strategy as well as selected analytical skills. The findings indicated that the students in the experimental class learned more than the control classes and were more enthusiastic about the instructional technique. The report is divided into two sections. Part 1 includes descriptions of the project, the experimental course, results of the course evaluations, and changes in the experimental version of the course resulting from the course evaluation. Part 2 presents some guidelines for college faculty inerested in considering the particular type of self-paced learning used in this project. This section describes the conclusions of the project, analyzes the strengths and weaknesses of the instructional approach, and examines some implications of this form of self-paced instruction for undergraduate history teaching and undergraduate education in general.

18. Block, James H., Ed. Schools, Society, and Mastery Learning. Articles based on papers presented at the Society, Schools, and Mastery Learning Symposium of the American Educational Research Association Convention (1973). New York: Holt, Rinehart and Winston, 1974. 148 pages. ED 093 835. Available only from Holt, Rinehart and Winston, Inc., 383 Madison Avenue, New York, New York 10017.

This book is a collection of essays on mastery learning, which is defined as an instructional philosophy that asserts that under appropriate instructional conditions virtually all, rather than some, students can learn most of what they are taught. The articles in this book are based on a symposium. Social scientists were contacted and asked to respond to the following question from the standpoint of their particular discipline: "If mastery learning could be successfully implemented, then what would be the implications for the school and society?" The book is divided into two parts with three essays in each part. Part 1 focuses on the "if" portion of the question. It is intended to introduce the reader to the current state of mastery learning theory, practice, and research and to set the stage for part 2. Part 2 centers on the "then" portion of the question. It is intended to sketch out some of the theoretical implications of mastery learning and to highlight some of its practical administrative implications.

19. Block, James H. Student Evaluation: Toward the Setting of Mastery Performance Standards. Paper presented at the annual meeting of the American Educational Research Association (Chicago, Illinois, April 1972). 28 pages. ED 065 605.

When the task of evaluating student learning is carefully considered, two major problems emerge. One is the gathering of the most appropriate and precise evidence possible about the learning. The other is the setting of performance standards against which this evidence may be weighed and the adequacy of each student's learning judged. This paper has focused on the problem of setting performance standards for use in strategies for mastery learning. The paper with the argument that a key variable in the design of these strategies are the mastery performance standards which students are helped to attain throughout their instruction. It was pointed out that presently there are no procedures for setting such standards. Next, an attempt was made to formulate one such procedure. The approach developed utilizes students' future learning, i.e., their scores on a set of desired, end-of-instruction learning outcomes, as a criterion for determining the mastery performance level which students must attain at any stage in their instruction. Finally, the paper reported an experiment designed to explore the feasibility of the approach proposed. The experiment was designed to test the assumption that the performance standard which a student attains over each segment of his instruction has important implications for his realization of the desired, end-of-instruction learning outcomes. In general, the experiment's results confirmed the assumption tested.

20. Block, James H. Student Learning and the Setting of Mastery Performance Standards. Educational Horizons, Vol. 50, No. 4, Summer 1972, pages 183-191. EJ 068 622.

The arbitrary setting of mastery performance levels is only tenable if the attainment of that level throughout an instructional sequence will yield greater learning outcomes than the non-attainment of that level, and if the attainment of the selected level will produce approximately the same outcome as would attainment of other possible levels. To test these hypotheses, 91 eighth-graders were divided into five groups and taught matrix arithmetic. Sixteen students in each class were assigned to mastery treatments, where each treatment helped the student reach a particular performance level, i.e., 65, 75, 85, or 95, percent of the material in each unit. The other students in each class were assigned to a non-mastery treatment. Achievement, learning rate, transfer, retention and attitude were measured with pre- and posttests. Results are discussed, along with implications for further research in the area of mastery learning.

21. Block, James H. Teachers, Teaching, and Mastery Learning. Today's Education, Vol. 63, No. 7, November-December 1973, pages 30-36. EJ 087 190.

A group-based strategy for mastery learning, exemplified by the work of Benjamin S. Bloom, is presented, with a detailed discussion of the accompanying operating procedures, and its implications for the classroom teacher.

22. Block, James H. Toward the Setting of Mastery Performance Standards in Veterinary Medical Education, in Learning Experiences, Proceedings of the Symposium on Veterinary Medical Education (June 18-21, 1972). 150 pages. ED 081 617.

This presentation consists of three parts. First, one reason why the best possible mastery standards are needed is suggested and then some characteristics of an ideal standard are proposed. Next, some techniques for setting standards which begin to approach this ideal are developed. Finally, a few of the many issues often encountered with the standard-setting problem are sketched.

23. Block, James H., and Tierney, Michael L. An Exploration of Two Correction Procedures Used in Mastery Learning Approaches to Instruction. Journal of Educational Psychology, Vol. 66, No. 6, December 1974, pages 962-967. EJ 118 385.

This study investigated the impact on college students' grades, achievement, and attitudes of the respective "correction" procedures used in Bloom- and Keller-type mastery learning strategies. Forty-four male and female students were taught European historiography using a 2 X 3 factorial, Pretest/No Pretest X Bloom-Type Correction/Keller-Type Correction/No Correction design. The findings indicate that periodic correction can improve at least the students' ability to apply the course material, but only if it is accomplished as in Bloom's strategy. The findings also suggest that pretesting can increase students' ability to apply the course materials and their attitudes toward history.

24. Bloom, Benjamin S. Learning for Mastery. Instruction and Curriculum. Regional Educational Laboratory for the Carolinas and Virginia. Topical Papers and Reprints, Number 1. Chicago, Illinois: University of Chicago, Dept. of Education; Durham, North Carolina: Regional Educational Laboratory for the Carolinas and Virginia. Reprint from Evaluation Comment, University of California at Los Angeles, Center

for the Study of Evaluation of Instructional Programs, May 1968. Also available from the Regional Educational Laboratory for the Carolinas and Virginia, Mutual Plaza (Chapel Hill and Duke Sts.), Durham, North Carolina 27701. 12 pages. ED 053 419.

Most students, perhaps over 90 percent, can master what teachers have to teach them, and it is the task of instruction to find the means which will enable students to master the subject under consideration. A basic task is to determine what is meant by mastery of the subject and to search for methods and materials which will enable the largest proportion of students to attain such mastery. That is, the basic task in education is to find strategies which will take individual differences into consideration but in such a way as to promote the fullest development of the individual. The thesis of this paper is that, to promote mastery learning, five variables must be dealt with effectively: (1) aptitude for kinds of learning, viewed as the amount of time required by the learner to attain mastery of the task; (2) quality of instruction, viewed in terms of its approaching the optimum for a given learner; (3) ability to understand instruction, i.e., to understand the nature of the task and the procedures to follow; (4) perseverance, the amount of time one is willing to spend in learning; and (5) time allowed for learning, the key to mastery.

25. Bloom, Benjamin S. Time and Learning. American Psychologist, Vol. 29, No. 9, September 1974, pages 682-688. EJ 105 074.

Arguing that a thorough understanding of time and its use in school learning may help improve the schools, the author reviews the research pertaining to models of school learning, mastery learning, and the parameter of time in the learning process.

26. Branchaw, Bernadine F., and Young, Ron C. Mastery Learning in Typewriting. Journal of Business Education, Vol. 50, No. 8, May 1975, pages 336-337. EJ 118 922.

The article illustrates a way typing students, with the guidance of a competent teacher, can individually progress toward prescribed competencies with the typewriter. The students are graded on how many assignments are completed and deemed "mailable" by the teacher. This grade may be combined with grades for timed writing or production rate for the final course grade.

27. Brandt, Ronald. On Mastery Learning: An Interview with James H. Block. Educational Leadership, Vol. 33, No. 8, May 1976, pages 584-589. EJ 145 528.

In this interview, James Block explains the model of mastery learning, which he developed with Benjamin Bloom, according to which individual differences in academic ability are lessened by appropriate teaching methods.

28. Breland, Nancy S., and Smith, Marshall P. Cognitive and Affective Outcomes of PSI Mastery Programs as Compared to Traditional Instruction. Paper presented at the annual meeting of the American Educational Research Association (Washington, D.C., March 30-April 3, 1975). 14 pages. ED 108 985.

While considerable research has been reported on cognitive outcomes of Personalized Student Instruction (PSI) courses modelled on Keller's work, little information about affective outcomes of the PSI is available. In this study three methods of instruction including an introductory psychology PSI with no formal classes, an educational psychology with some formal classes, and a traditionally-taught introductory psychology with all formal classes were used to investigate affective outcomes. Students responded to 12 items designed to sample various levels from the Taxonomy of Educational Objectives: Affective Domain. In the last item students ranked all the courses they were taking that semester from most favorite to least favorite. The results indicated no significant differences in affective outcomes. Combining scores across all items showed a very small advantage for the PSI students. It is clear that PSI students, who are not exposed to a program in a formal classroom situation, show no affective disadvantage when compared to traditionally taught students.

29. Brennan, Robert L. The Evaluation of Mastery Test Items. Final Report. 255 pages. ED 092 593.

The first four chapters of this report primarily provide an extensive, critical review of the literature with regard to selected aspects of the criterion-referenced and mastery testing fields. Major topics treated include: (a) definitions, distinctions, and background, (b) the relevance of classical test theory, (c) validity and procedures for test construction, and (d) test reliability. Chapter V provides a treatment of criterion-referenced and mastery item analysis and revision procedures when items are scored in the classical correct/wrong manner. Chapter VI treats an alternative to the classical procedure for administering and scoring items. This procedure employs the subjective probabilities typically associated with confidence testing in order to obtain pseudo-classical scores. These scores, which have not been considered elsewhere, appear to be very useful for item analysis purposes since they have most of the advantages and few of the disadvantages of both classical scores

and subjective probabilities. Chapter VII provides an analysis of a set of data collected to illustrate many of the statistics and procedures discussed in Chapter V and VI. One of the appendices provides the manual for an extensive test scoring and item analysis program that uses student subjective probabilites as input.

30. Burke, J. Bruce, and others. Competency Designs for a More Humane Education. Paper presented at the annual meeting of the Association for Educational Data Systems (New Orleans, Louisiana, April 16-19, 1973). 11 pages. ED 087 421.

A computer-assisted, mastery learning model has been developed for a teacher education program. It is based on the assumptions that individuals should control their own lives and that technology should be used to expand the range of human choice. The model uses a systems approach to organize the human, curricular and environmental variables of instruction; in addition, students participate in decision-making, instruction is modular, mastery criteria are used, the affective side of learning is attended to, and an enhanced self concept for the student is sought. Students join small groups, interact with an academic counselor, and have access to a Learning Center with varied resource personnel. They select educational experiences according to their interests and employ the computer to help put themselves through instructional modules whose components include the statement of objectives, pre-testing, the presentation of instructional material, reference to resources, and post-testing. Implementation strategies include, among others, seminars, small group instruction laboratories, computer-assisted instruction and auto-tutorial sessions.

31. Burrows, Charles K., and Okey, James R. The Effects of a Mastery Learning Strategy on Achievement. Paper presented at the annual meeting of the American Educational Research Association (Washington, D.C., March 30-April 3, 1975). 13 pages. ED 109 240.

Bloom has argued that most students, not just a few, should be able to do top quality school work if given appropriate instruction. Mastery learning, which includes frequent diagnostic testing followed by remedial instruction, has been proposed as an effective strategy for increasing pupil achievement. In this study, teachers used a mastery learning strategy with elementary school students in a geometry unit. An analysis of the data indicated that low mathematics aptitude fourth graders taught using a mastery strategy achieved at as high a level as high aptitude fifth graders taught in a more conventional manner.

32. Butler, F. Coit. "Learning for Mastery: A Formative Evaluation Quiz to Test Your Knowledge of Bloom's Concepts," in Handbook on Formative and Summative Evaluation of Student Learning. New York: McGraw-Hill, 1971. 23 pages. ED 068 508. Available only from Van Valkenburgh, Nooger and Neville, Inc., 15 Maiden Lane, New York, New York, 10038 ($0.40).

A new Formative Evaluation Test on Bloom's paper "Learning for Mastery" is presented. The self-instructional quiz has the principles of mastery learning in it, features instant knowledge of results coupled with prescriptive feedback, and has a non-punitive student self-scoring and item-of-difficulty identification system. It should be an effective exercise for indoctrination in the important concepts of the Bloom learning philosophy and in the implementation of formative evaluation testing. The test packet comes complete with a reprint of the Bloom article and is suitable for use as a class demonstration/experiment for education or psychology students.

33. Carlson, John G., and Minke, Karl A. Fixed and Ascending Criteria for Unit Mastery Learning. Journal of Educational Psychology, Vol. 67, No.1, February 1975, pages 96-101. EJ 118 399.

Mastery criterion manipulation may produce dramatic behavioral effects. Results of a study investigating three undergraduate classes indicate that the 90 percent criterion class was inferior to both the 80 percent and the varied 60-90 percent criterion class on several measures, including degree of accuracy and final grade.

34. Carmichael, Dennis. Mastery Learning: Its Administrative Implications. Paper presented at the annual meeting of the American Educational Research Association (New Orleans, Louisiana, February 25-March 1, 1973). 13 pages. ED 075 946.

This paper is based on two premises. The first is that there are five conditions of readiness which determine the success or failure of educational innovations such as that of mastery learning. These are: (1) The desire to change the status quo, (2) a systematic management process, (3) effective leadership, (4) a receptive teaching staff, and (5) financial resourcefulness. The second premise is that instructional innovations, including mastery learning will be successfully implemented and will persist only when the teaching staff, adminstration, board, students, and patrons work together to (1) assess student learning needs; (2) analyze existing educational goals, objectives, and instructional programs; (3) derive new goals, objectives, and programs based on needs assessment and problem analysis; (4) implement and monitor

revised programs, including instructional innovations; and (5) evaluate the outcomes of instructional innovations. The assertion is also made that the lack of, or the weakening of, any of these conditions will lessen the chances of successful and lasting educational innovation.

35. Collins, Kenneth. An Investigation of the Variables of Bloom's Mastery Learning Model for Teaching Mathematics. Paper presented at the annual meeting of the American Educational Research Association (Chicago, Illinois, April 1972). 20 pages. ED 065 596.

The purposes of this study were to examine and evaluate the importance of three variables of Bloom's mastery learning model. The variables studied were specification of objectives, use of diagnostic-progress (d-p) tests, and use of alternate resources. The study used four seventh grade and four eighth grade classes: each grade classes were pretested each semester on course objectives. There was no significant difference among the classes at the .25 level. Each class took chapter, unit, and semester (posttest) exams based on the objectives. The first semester eighth grade classes received four different treatments: no variables (control class), behavioral objectives, objectives and daily ungraded d-p tests with recommendations, objectives and d-p tests with recommendations that included alternate resources. There was a significant difference between the control class and each treatment class. Using second semester seventh grade classes, a comparison between a control class and a class using daily ungraded d-p tests with recommendations was significant at the .05 level. The results indicate that the use of either a list of specific objectives or d-p tests with recommendations is sufficient for a significant increase in student mastery of the objectives. The second semester seventh grade classes received four different treatments: no variables, general objectives, specific objectives, and daily ungraded d-p tests with recommendations. There was a significant difference between classes using specific and general objectives at the .10 level.

36. Continous Progress Program Inservice Materials. Chicago, Illinois: Chicago Board of Education, 1971. 196 pages. ED 077 914. Hard copy available only from the Chicago Board of Education, 228 N. LaSalle Street, Chicago, Illinois 60601.

The Continuous Progress Program of the Board of Education for the city of Chicago focuses on the improvement of education for the individual child and the upgrading of educational practices and techniques. The philosophy of the program is based on the individualized rate of teaching and learning of the pupil. Its planning and organization is dependent upon the involvement of teachers, administrators, students, and parents. Behavioral

objectives, mastery learning, specialized learning problems, and curriculum development aids are included in the curriculum of the program. Various teaching approaches are used, with an emphasis on the need for individualization. The King School Reading and Mathematics Skills Charts are employed as aids in curriculum development along with the Schubert School Continuous Syllabus. The program stresses the need for flexible classrooms, continuous communication with parents, and an accurate pupil evaluation. (A three-page bibliography is included along with forms used for communication with parents and evaluation of pupils.)

37. Contreras, Gloria. Mastery Learning: The Relation of Different Criterion Levels and Aptitude to Achievement, Retention, and Attitude in a Seventh Grade Geography Unit. Ed.D. Dissertation, University of Georgia, 1975. Also available from Geography Curriculum Project, 107 Dudley Hall, University of Georgia, Athens, Georgia 30601 ($5.00). 230 pages. ED 111 739.

This study is an assessment of the effect of three criterion mastery levels and aptitude on the achievement, retention, and attitude of seventh grade students using a population geography text. The three criterion levels used were 90 percent, 80 percent, and 70 percent of the correct responses on each of 41 lessons in "Population Growth in the United States and Mexico." Aptitude was measured by a word meaning text. Aptitude was a major independent variable because of the premise that mastery procedures may overcome achievement difficulties of low aptitude students. Contrary to most of the literature on mastery learning, the results indicate that mastery on formative exercises did not contribute to higher levels of achievement on the summative test. The study also failed to show that achievement, retention, or attitude toward the unit differed among the three criterion groups. The study confirmed that previous knowledge, as measured by a word meaning test, was a more potent factor in achievement than were differential criterion levels.

38. Courtney, E. Wayne. A Report of the Individualized Continual Progress Approach to the Teaching of Research Foundations at Stout State University. Menomonie, Wisconsin: Stout State University, Graduate School, August 1969. 35 pages. ED 041 539.

The major purpose of the experience described in this report was to determine what functional problems tended to develop under an individualized continual progress approach when large numbers of students were enrolled and multiple instructional staff loads were maximized. This report describes: (1) the nature of the instruction, the basic components of which were: self-sequencing, self-pacing, instructional packages, mastery learning and behavioral objectives; (2) the background

of the students involved; (3) the nature of the instructional team; (4) the testing facility; (5) student responses to the course in terms of study time and student attitudes toward the course; and (6) retention patterns. The report concludes with some observations on the problems encountered - the major one of which seemed to be the difficulty the instructional staff member had in changing his role from classroom lecturer to personal consultant - and suggestions for conducting a successful course. The Students' Guide and the research questionnaire are included in the appendix.

39. Crehan, Kevin D. Item Analysis for Teacher-Made Mastery Tests. Journal of Educational Measurement, Vol. 11, No. 4, Winter 1974, pages 255-262. EJ 108 462.

Various item selection techniques are compared on resultant criterion-referenced reliability and validity. Techniques compared include three nominal criterion-referenced methods, a traditional point biserial selection, teacher selection, and random selection. Eighteen volunteer junior and senior high school teachers supplied behavioral objectives and item pools ranging from 26 to 40 items. Each teacher obtained responses from four classes. Pairs of tests of various length were developed by each item selection method. Estimates of test reliability and validity were obtained using responses independent of the test construction sample. Resultant reliability and validity estimates were compared across item selection techniques. Two of the criterion-referenced item selection methods resulted in consistently higher observed validity. However, the small magnitude of improvement over teacher or random selection raises a question as to whether the benefit warrants the necessary extra effort on the part of the classroom teacher.

40. Cross, K. Patricia. The Elusive Goal of Educational Equality. Adult Leadership, Vol 23, No. 8, February 1975, pages 227-232. EJ 110 583.

Higher education is beginning to place emphasis on process rather than on selection, and educators are increasingly willing to deal with individual differences in learners. Three teaching models illustrate the continuum of change: (1) the remedial model, which attempts to "correct" individual differences at the point of entry into college; (2) the educator's model, which uses Bloom's or Keller's plan to insure that all students reach a certain level of mastery before graduation; and (3) the pluralistic model, which insists that learners can enter college with differences, can proceed through college in varied ways, and can exit from college with different competencies.

41. Cross, K. Patricia. Mastery Learning: The New Classroom Revolution. AGB Reports, Vol. 18, No. 4, July/August 1976, pages 21-28. EJ 143 152.

A new idea is catching on fast: instead of giving all students the same classroom time and grading A to F, give each the time and the teaching technique he or she needs to master the subject.

42. Davis, William J. The Mastery Learning and Conventional Modes of Instructing College-Level Composition: A Comparative Study Based Upon Selected Student Characteristics. Ed.D. Dissertation, Oklahoma State University, 1975. 132 pages. ED 120 789. Available only from University Microfilms, P.O. Box 1764, Ann Arbor, Michigan 48106 (Order No. 75-9557, MF $7.50, HC $15.00).

This study investigated the validity of the research methodology which sought to compare methods of instruction through the application of univariate statistical procedures, to contribute to the development of the theoretical position which contended that students of different abilities, needs, preferences, and attitudes should be differentially instructed, and to yield information which may be used to counsel and guide students in their choices of instruction. Conventional and mastery methods of instruction were employed to instruct over 500 freshmen English composition student. It was found that there was no significant difference between the mastery learning and conventional modes of instruction; different "kinds" of students achieved different levels of "success" between the two modes of instruction; and the student was a significant variable in the instructional process, but not the major variable.

43. Deaton, William L., and others. Grade Expectations Within a Mastery Learning Strategy. Paper presented at the annual meeting of the American Educational Research Association (San Francisco, California, April 19-23, 1976). 16 pages. ED 126 105.

Final course grade expectations of students in two models of instruction (mastery and nonmastery) were investigated. The intent of the study was to examine expectations between groups and to analyze within-mastery effects on self-perception of performance. Using preinstruction grade expectation, postinstruction grade expectation, Grade Point Average (GPA), and number of formative exams taken as independent variables and final exam scores as the criterion, relationships were obtained through stepwise multiple correlation analysis. Results suport the validity of the feedback mechanisms within the mastery strategy in relation to a more accurate self-assessment of knowledge level and expected grade from pre- to post-instruction.

44. Decker, Dwight F. A Comparison of Criterion-Referenced and Norm-Referenced Approaches to the Teaching of Physical Science. Ed.D. Procticum, Nova University, June 1974. 23 pages. ED 100 438.

A criterion-referenced approach to a physical science course for nonmajors was implemented at Rhode Island Junior College. The basic unit of knowledge for this study was motion and the related topics were force, work, energy, power, and momentum. At completion, each student was expected to exhibit the ability to: (1) use energy more efficiently, (2) provide better for his own safety and the safety of others, and (3) have greater appreciation for the interrelationship of all forms of energy. Instruction was designed to allow mastery by each student. Students could repeat mastery exams until they achieved a mark for evaluation that met their own aspirations for the course. Tables and graphs were used to indicate the success of the criterion-referenced approach as opposed to the norm-referenced approach, which was used for this course previously. When results from an evaluation exam given to students from both approaches were compared, the criterion-referenced group averaged 10 points higher than the norm-referenced group. In addition, the criterion-referenced group expressed high satisfaction with the course and indicated a desire to take more courses using the same approach.

45. Detheux, M., and others. From Compensatory Education to Mastery Learning. London Educational Review, Vol. 3, No. 3, Autumn 1974, pages 41-50. EJ 131 967.

Research on reading and mathematics in two first year classes in a working class district is discussed. One class was taught using the mastery learning approach, which attempts to help every child attain operationally defined objectives; the other class was taught in the traditional manner.

46. DiBiasio, Guy N. Mastery Learning: Implications for the English Curriculum. English Education, Vol. 4, No. 2, Winter 1973, pages 106-115. EJ 079 126.

A basic task for all teachers is to determine what we mean by "mastery of a subject" and to search for the methods and materials which will enable the largest proportion of our students to attain such mastery. Blooms's strategy for mastery learning includes defining the cumulative sequence, the purpose and the content of a specific curriculum. The implications of this strategy for English teachers is discussed here.

47. Earle, Richard A. Reading Education for Secondary School Content Areas: Genesis and Rationale. Teacher Education Forum Series. Vol. 2, No. 7. Bloomington: Indiana University, School of Education, February 1974. 14 pages. ED 099 317. Available only from the Division of Teacher Education, 325 Education Building, Indiana University, Bloomington, Indiana 47401.

This paper describes the development of a course in secondary school reading methods which was designed to meet the diverse needs and objectives of students who intend to become either content specialists or reading specialists. Students are presented with 23 instructional objectives from which they choose the ones which satisfy their needs. Each of the objectives is accompanied by an instructional unit which consists of (a) statement of the purpose of the unit; (b) statement of objective; (c) pretest or formative test; (d) basic text and references; (e) other learning alternatives, including audio or video tapes; (f) posttest or mastery task; and (g) student evaluation of objectives, procedure, materials, and self. The course combines some of the characteristics of, but is not limited to, competency-based teacher education, mastery learning, and criterion-referenced testing. The paper includes a brief description of each of the 23 instructional units.

48. Eastmond, Jefferson N. An Assessment of Educational Needs in the San Francisco South Bay Area of California. Project BASICS. Salt Lake City, Utah: World-Wide Education and Research Institute, 1971. Available in three booklets: 56 pages, ED 082 304; 46 pages, ED 082 305; 55 pages, ED 082 306.

Project BASICS attempts to determine which of the successfully demonstrated reading and mathematics strategies will produce mastery learning for different types of students in terms of their individual characteristics and needs. It focuses on the discovery and implementation of alternative strategies for mastery learning with an innovative school setting. The overall objective is to provide solution strategies for students (K-3) to result in 90 percent of the project students achieving at the same mastery level as the top 20 percent of California students in normal classroom situations. The project seeks to resolve the problem of reading, communications skills, and mathematics deficiencies by using the seven basic steps of the scientific method in its system approach to education planning and problem solving. The first booklet of the series describes the steps taken to identify the critical needs in the South Bay Area; the second booklet is devoted to translating these identified needs into problems and constraints; and the third booklet deals with analyzing these problems for objectives.

49. Edmonston, Leon P., and Randall, Roberts. A Model for Estimating the Reliability and Validity of Criterion-Referenced Measures. Paper presented at the annual meeting of the American Educational Research Association (Chicago, Illinois, April 1972). 21 pages. ED 065 591.

A decision model designed to determine the reliability and validity of criterion referenced measures (CRMs) is presented. General procedures which pertain to the model are discussed as to: Measures of relationship, Reliability, Validity (content, criterion-oriented, and construct

validation), and Item Analysis. The decision model, presented in an appendix, includes two sections, Validation Procedures for Criterion Referenced Measures: Unit Tests, and Validation Procedures for Criterion Referenced Measures: Mastery Tests.

50. Eller, M.L. Individualized Learning Using TV. Educational Broadcasting, Vol. 8, No. 4, July-August 1975, pages 27-32. EJ 123 000.

A teacher-managed system of individualized mastery learning, as implemented by the Fremont Unified School District in Fremont, California, is described.

51. Ely, Donald, and Minars, Ed. The Effects of a Large Scale Mastery Environment on Students' Self Concept. Journal of Experimental Education, Vol. 41, No. 4, Summer 1973, pages 20-22. EJ 088 825.

The Tennessee self-concept scale was used to measure the self-concept of eighty-eight college freshmen at the end of their first semester in college. Forty-four of these students had been randomly assigned to a large scale mastery learning environment, and the other forty-four were randomly assigned to conventional classes. T-test ratios indicate that the mastery learning students have higher self-concepts than do their conventional counterparts.

52. Emrick, John A. An Evaluation Model for Mastery Testing. Journal of Educational Measurement, Vol. 8, No. 4, Winter 1971, pages 321-326. EJ 048 077.

Noting the desirability of the current shift toward mastery testing and criterion-referenced test procedures, an evaluation model is presented which should be useful and practical for such purposes. This model is based on the assumptions: (1) that the learning of fundamental skills can be considered all or none; (2) that each item response on a single skill test represents an unbiased sample of the example's true mastery status; (3) that measurement error occurring on the test (as estimated from the average interitem correlation) can be of only one type for each examinee; and (4) that through practical and theoretical considerations of evaluation error costs and item error characteristics, an optimal mastery criterion can be calculated. Each of these assumptions is discussed and the resultant mastery criteria algorithm is presented along with an example from the Individually Prescribed Instruction (IPI) math program.

53. Epstein, Kenneth I., and Knerr, Claramae S. Criterion-Referenced Test Interpretations of "Classical" Measurement Theory. Paper presented at the annual meeting of the American Educational Research Association (San Francisco, California, April 19-23, 1976). 13 pages. ED 126 154.

The literature on criterion-referenced testing is full of discussions concerning whether classical measurement techniques are appropriate, whether variance is necessary, whether new indices of reliability are needed, and the like. What appears to be lacking, however, is a clear and simple discussion of why the problems occur. This paper suggests that many of the results obtained when classical techniques are applied to criterion-referenced tests, particularly in the context of mastery learning, are perfectly reasonable, interpretable, and should be expected.

54. Fadil, Virginia Ann. More Understanding and Appreciation: Learning for Mastery in Literature Course. TESOL Quarterly, Vol. 9, No. 4, December 1975, pages 367-377. EJ 131 091.

A pilot course in mastery learning in a survey course in English literature at the Beirut University College is described. The course was designed to increase the retention of knowledge and skills of students of another culture, utilizing the lecture-discussion method and mastery learning concepts.

55. Fagan, James S. The Relationship of Mastery Procedures and Aptitude to the Achievement and Retention of Transportation-Environmental Concepts by Seventh Grade Students. Paper presented at the annual meeting of the American Educational Research Association (San Francisco, California, April 19-23, 1976). 9 pages. ED 123 150.

This study examined the relationship between two independent variables, mastery and aptitude, on two dependent variables, achievement and retention. Aptitude was measured by administering the word meaning section of the Iowa Test of Basic Skills. Achievement and retention were measured by a researcher-constructed test. The study involved 17 seventh-grade social studies classes in Dallas, Texas. The students were taught an instructor-developed geography unit with either mastery or nonmastery procedures. The results indicated that the mastery treatment was not superior to the nonmastery treatment in either achievement or retention and that prior verbal ability proved to be the dominant factor in both achievement and retention. References and a listing of procedures followed by mastery and nonmastery groups in the experimental study are included.

56. Fehlen, Joan E. Mastery Learning Techniques in the Traditional Classroom Setting. School Science and Mathematics, Vol. 76, No. 3, March 1976, pages 241-245. EJ 136 702.

Based on mastery learning strategies developed by Bloom, a mathematics content course for prospective elementary teachers was divided into three treatment groups. The first group was allowed up to three retakes

of a unit test if they did not achieve the 90 percent designated mastery level. Treatment 2 students who did not achieve the 90 percent mastery level on a unit test were required to spend one hour receiving tutorial help on the objectives missed before they were allowed to retake the unit test. The third group was not allowed to retake tests or receive special tutorial help. Results indicated that a designated mastery level combined with the use of retesting produced consistently higher mean achievement scores and higher mean attitude scores. The use of tutorial help did not affect the results.

57. Fehlen, Joan Elizabeth. A Study of Selected Variables Associated with Mastery Learning in a College Mathematics Course for Prospective Elementary Teachers. Ph.D. Dissertation, University of Minnesota, 1973. 252 pages. ED 090 045. Available only from University Microfilms, 300 North Zeeb Road, Ann Arbor, Michigan 48106 (order No. 73-29, 407. MF $4.00. HC $10.00).

Investigated was the effect of diagnostic progress tests and tutorial help to promote mastery learning on achievement and attitudes of students enrolled in a mathematics course for prospective elementary teachers. All students were pre-tested with an achievement test covering all the objectives of the course and with both Dutton's and Aiken's attitude scales. Students were blocked into three ability levels based on the achievement test and then assigned to one of three treatments. Treatment I students were allowed up to three retakes of any unit test if they did not achieve the 90 percent mastery level. Treatment II students who did not achieve the 90 percent mastery level on a unit test were required to spend one hour receiving tutorial help on missed objectives before they were allowed to retake a unit test. Treatment III students could not retake tests. Students were post-tested with an achievement test and the two attitude tests. Analysis of covariance was used to analyze data with ACT mathematics scores and pre-measures on attitude as covariates for corresponding variates. The results indicated that the crucial factor was the opportunity to retake tests.

58. Fels, Rendigs. The Vanderbilt-JCEE Experimental Course in Elementary Economics. New York: Joint Council on Economic Education, 1974. Hard copy available from the Joint Council on Economic Education, 1212 Avenue of the Americas, New York, New York 10036 ($2.00). 95 pages. ED 102 059.

Alternatives to the standard lecture course in introductory economics are presented in this series exploring new teaching methods in college level economics. In this issue "elementary" or introductory economics taught at Vanderbilt University is described. It relies on two techniques: case method and self-paced instruction. Self-paced instruction is seen to provide mastery of economic principles while case study reinforces theory by applying it. The rationale for the

course and the components of the course-techniques to ensure mastery learning, evaluation plans, use of proctors, record keeping, cost vs. benefits, course adaptations, and choice of textbooks-are explained in the introduction. The bulk of the document consists of the course syllabus and study guides for each of the 10 self-paced sections and for the final examination. Included in the appendices are an example of a case study, an article on developing independent problem-solving ability in elementary economics, and textbook alternatives keyed to the self-paced syllabus. Also provided in the appendix is "The Case Method in an Otherwise Conventional Course," a course description containing instances where case study is incorporated in a lecture class. An "Afterword" notes changes that the authors would like to make in the content of various sections of the self-paced course.

59. Fuller, Robert G., ed., and others. Study Modules for Calculus-Based General Physics. Lincoln: Nebraska University, 1975. Prepared at a College Faculty Workshop (University of Colorado, Boulder, June 23-July 11, 1975). Entire set of 42 modules available from University of Nebraska, CBP Workhops, Behlen Laboratory of Physics, Lincoln, Nebraska 68588 ($15.00). ED 121 578. 83 pages. Module 1: Dimensions and Vector Addition; Module 2: Rectilinear Motion, plus a trigonometry and calculus review. ED 121 579. 82 pages. Module 3: Planar Motion; Module 4: Newton's Laws; Module 5: Vector Multiplication. ED 121 580. 75 pages. Module 6: Work and Energy; Module 7: Applications of Newton's Laws. ED 121 581. 75 pages. Module 8: Conservation of Energy; Module 9: Impulse and Momentum; Module 10: Rotational Motion. ED 121 582. 90 pages. Module 11: Collisions; Module 12: Equilibrium of Rigid Bodies; Module 13: Rotational Dynamics; Module 14: Fluid Mechanics. ED 121 583. 85 pages. Module 15: Gravitation; Module 16: Simple Harmonic Motion; Module 17: Traveling Waves, plus a Partial Derivatives Review. ED 121 584. 92 pages. Module 18: Sound; Module 19: Temperature, Heat, and Thermodynamics; Module 20: Kinetic Theory of Gases. ED 121 585. 86 pages. Module 21: Second Law and Entropy; Module 22: Coulomb's Law and the Electric Field; Module 23: Flux and Gauss' Law. ED 121 586. 82 pages. Module 24: Electric Potential; Module 25: Ohm's Law; Module 26: Capacitators. Ed 121 587. 85 pages. Module 27: Direct-Current Circuits; Module 28: Magnetic Forces; Module 29: Ampere's Law; Module 30: Faraday's Law. ED 121 588. 83 pages. Module 31: Inductance; Module 32: Wave Properties of Light; Module 33: Interference; Module 34: Introduction to Quantum Physics. ED 121 589. 77 pages. Module 35: Reflection and Refraction; Module 36: Electric Fields and Potentials from Continuous Charge Distributions; Module 37: Maxwell's Predictions. ED 121 590. 75 pages. Module 38: Optical Instruments; Module 39: Diffraction; Module 40: Alternating Current Circuits. ED 121 591. 63 pages. Module 41: Lenses and Mirrors; Module 42: Relativity, and an Appendix.

This series of 42 Calculus Based Physics (CBP) modules includes study guides, practice tests, and mastery tests for a full-year individualized course in calculus-based physics based on the Personalized System of Instruction (PSI). The units are not intended to be used without outside materials; references to specific sections in four elementary physics textbooks appear in the modules.

60. Garner, Raymond. Mastery Learning: Fact or Fiction? Agricultural Education Magazine, Vol.47, No. 6, December 1974, pages 123-124, 126. EJ 105 367.

Is mastery learning an effective strategy in the teaching of vocational agriculture? Instructional Management Problems, the individualized instruction approach, and performanced based curriculum are topics investigated in answering this question.

61. Garner, William T. The Identification of an Educational Production Function by Experimental Means. Paper presented at the annual meeting of the American Educational Research Association (New Orleans, Louisiana, February 25-March 1, 1973). 48 pages. ED 075 933.

Eighth grade students, randomly assigned to three criterion performance levels, studied matrix algebra using a mastery learning strategy. Student achievement, ability, time spent, and other measures were obtained: and minimal variance criterion performance levels, analogous to production isoquants, were attained. A Cobb-Douglas (log-linear) function was estimated by regression, with output (criterion levels) exogenous and time to mastery used as a dependent variable. The use of the function to predict the time required for various student ability and performance combinations is illustrated. Costs and implications for equity/efficiency decisions in school management and finance are discussed using various assumptions.

62. Garner, William T. Inputs and Outputs in the Educational Process. Paper presented at the annual meeting of the American Educational Research Association (New York, New York, February 2-7, 1971). 21 pages. ED 075 948.

The purpose of this paper is to discuss some of the problems and prospects of applying production function or input-output analysis to the process of schooling. The cognitive aspect of schooling is discussed here and is restricted to those aspects readily measured by achievement tests. It is argued that education production function studies should rely less on large-scale survey data; and that they should instead develop microdata on actual processes, especially by means of the experimental identification of production functions. It is also suggested that mastery learning strategies can be used as investigatory tools in the analysis of educational production relationships.

63. Goldner, Ralph H. Mastery Learning. Instructor, Vol 82, No. 10, June/July 1973, page 15. EJ 079 791.

Mastery learning can have several advantages for students: it gives a student the feeling of control over his environment; the student acquires self confidence; and the student develops an interest in further learning. Bloom's strategy for mastery learning includes several variables that must be considered: the student's aptitude, the quality of instruction, the student's perseverance, and the time allowed for instruction.

64. Goldwater, B.C., and Acker, L.E. Instructor-Paced, Mass-Testing for Mastery Performance in an Introductory Psychology Course. Teaching of Psychology, Vol. 2, No. 4, December 1975, pages 152-155. EJ 130 296.

Half the students registering in the Introductory Psychology course at the University of Victoria were assigned to a mastery performance group, modeled on Keller's principles of mastery learning with the exceptions that it was instructor-paced and it involved mass testing. The results suggest that a weekly quiz procedure, when coupled with a mastery criterion, is sufficient to generate clear benefits in performance. Further research is necessary to clarify the relative contribution of a mastery criterion and weekly testing combination in improving student performance.

65. Hambleton, Ronald K. A Review of Testing and Decision-Making Procedure for Selected Individualized Instructional Programs. 1972. 45 pages. ED 080 592.

Results are presented of an investigation made to (1) provide a description of the testing models that are currently being used in selected individualized instructional programs; (2) compare three programs along the component parts of the testing model, namely, selection of a program of study, criterion-referenced testing on the unit objectives, assignment of instructional modes, and final year-end assessment; and (3) briefly outline several promising lines of research in connection with the testing methods and decision procedures for individualized instructional programs. The three programs selected for study were: Individually Prescribed Instruction, Program for Learning in Accordance with Needs, and Mastery Learning. An introduction, which includes a brief history, the content areas covered, and an indication of the extent of implementation, is provided for each instructional paradigm and details on the testing model are provided. An attempt is made to pinpoint the decision points in each model, explaining the consequences of the various possible actions in relation to each of the "possible true states of nature." A lengthy list of references is included.

66. Hambleton, Ronald K. Testing and Decision-Making Procedures for Selected Individualized Instructional Programs. Review of Educational Research, Vol. 44, No. 4, February 1974, pages 371-400. EJ 114 980.

Testing models of three instructional programs (Individualized Prescribed Instruction, Program for Learning in Accordance with Needs, and Mastery Learning) are described and compared. Several important lines of research that could contribute significantly to the quality of testing and decision-making within the context of these and other individualized instructional programs are outlined.

67. Hapkiewicz, Walter G. Mastery Learning Options in Teaching Educational Psychology. Paper presented at the annual meeting of the American Educational Research Association (Chicago, Illinois, April 1972). 12 pages. ED 060 065.

This paper examines a program instructing pre-service and practicing teachers in educational psychology. It is concluded that the program, which utilizes a mastery approach, produces significantly better results than does the traditional method.

68. Harris, Chester W. An Index of Efficiency for Fixed-Length Mastery Test. Paper presented at the annual meeting of the American Educational Research Association (Chicago, Illinois, April 1972). 10 pages. ED 064 349.

The efficiency of mastery tests of fixed length which sorts students into two categories is analyzed. For the sort of the students, an index, suggested by Fisher's linear discriminant function for two groups, is provided.

69. Healy, John R., and Stephenson, Larry K. Unit Mastery Learning in an Introductory Geography Course. Journal of Geography, Vol. 74, No. 1, January 1975, pages 25-31. EJ 111 586.

The unit mastery learning system is a method of individualized, self-paced learning which, through repeatable testing, enables students to attain a mastery of the content of one unit before proceeding to the next in the program. It is fashioned after the personalized system of instruction developed by Fred Keller, and its application to an introductory geography course at Hilo College, Hawaii, is described here.

70. Higgins, F. and Laplante, D. Self-Paced Mastery Learning as Applied to Introductory Sociology. Sarnia, Ontario: Lambton College of Applied Arts and Technology, Dept. of Social Science. Paper presented at the

spring meeting of the Community College Social Science Association (San Diego, California, March 1974). 24 pages. ED 092 182.

The objectives of this paper are threefold: (1) to present the structure and functioning of a system of "self-paced mastery learning" as evolved by the department over the period May 1972 to March 1974; (2) to discuss perceived "flaws" in traditional college level "learning systems " and receive input from readers regarding the educational relevance of the approach; and (3) to receive specific suggestions regarding further modifications of the system.

71. Hoffman, Alf. Indicated Undergirdings of Mastery Learning. Study conducted at Adler Center, Champaign, Illinois, November 1974. 17 pages. ED 104 098.

The pre- and posttestings of 30 emotionally disturbed children (median age, 10.3 years) provided with short term residential services (median stay, 8.2 months) in a mental health facility were evaluated to determine if there was a significant time rate of change in mastery learning and if the significant factors could be identified. The test battery included the Wechsler Intelligence Scale for Children, the Wide Range Achivement Test, the Illinois Test of Psycholinguistic Abilities, and the Gray Oral Reading Test. Results indicated that time on-task, on-task concentration, and short term memory were significantly related to undergirding capabilities and skills required for mastery learning; and that subjects made greater than expected academic gains.

72. Honeycutt, Joan K. The Effects of Computer Managed Instruction on Content Learning of Undergraduate Students. Paper presented at the annual meeting of the American Educational Research Asociation (Chicago, Illinois, April 15-19, 1974). 14 pages. ED 089 682.

Research was conducted to determine the effectiveness of computer-managed instruction (CMI) as an aid to the mastery of factual content, as compared to the method of frequent, pre-announced quizzes. One section of an undergraduate education course received conventional instruction along with quizzes; another section used a CMI program whose major features included mastery learning, self-pacing, self-instruction, provision for individual differences, and extensive record keeping. All other instructional activities were held constant across both groups. Pre-test evaluation of content knowledge yielded no significant differences between the groups prior to treatments; post-test results indicated that the CMI group achieved significantly greater mastery of the factual content.

73. Hymel, Glenn M. An Investigation of John B. Carroll's Model of School Learning as a Theoretical Basis for the Organizational Structuring of Schools. Final Report. New Orleans, Louisiana: New Orleans University, 1974. 363 pages. ED 093 702.

Reported is an investigation designed to (1) utilize the Carroll model as a framework for implementing a mastery learning strategy in a nongraded setting, (2) identify the Carroll model as a possible theoretical basis for administrative decisions regarding the organizational structuring of schools, and (3) test certain hypotheses derived from the model which have implications concerning school organization. The Carroll model of school learning is a paradigm describing the degree of learning that occur in a school setting as a function of time spent on a learning task divided by time needed for its mastery. Seventeen null hypotheses were investigated in the study which used a sample of 169 students enrolled in an algebra I unit focusing upon the four basic operations. Among the major findings was that a high quality of instruction characterized by feedback/correction procedures fostered a significantly greater degree of learning among students and a significantly greater number of classes spent by students than did a low quality of instruction characterized by the absence of feedback/correction procedures. The Carroll model's hypothesized interaction between ability to understand instruction and quality of instruction relative to degree of learning was confirmed statistically.

74. Jones, Emmet L., and others. Mastery Learning: A Strategy for Academic Success in a Community College. Topical Paper No. 53. Los Angeles: University of California at Los Angeles, ERIC Clearinghouse for Junior Colleges, December 1975. 54 pages. ED 115 315.

This paper describes the implementation of a mastery learning approach to instruction at Olive-Harvey College (OHC) in Chicago, and outlines planning and operating procedures for its implementation at other institutions. This approach was attempted at OHC as a response to the decreasing abilities of entering students, after many other innovative techniques had been tried with limited success. The mastery learning strategy rested on a foundation of fundamental propositions about learning, and seemed in accord with the community college's philosophic emphasis on instruction. The paper describes the development of course objectives, establishment of achievement criteria, definition of learning units and identification of learning elements, and the construction of diagnostic tests and prescriptive remedial materials. In general, the mastery learning approach has been judged successful at OHC; although some problems have been encountered, a greater level of achievement has been attained by students in mastery learning classes. Mastery learning has permitted traditional group instruction within the fixed academic calendar. It has not required administrative restructuring, complex instructional hardware, curricular change, or a large budget allocation; thus it lends itself to implementation in many different college situations.

75. Jones, F. Geoffrey. The Effects of Mastery and Aptitude on Learning, Retention, and Time. April 1976. 16 pages. ED 126 381.

This study used a self-instructional geography unit in 20 seventh-grade classes to assess the effects of a mastery learning procedure and aptitude upon learning, retention and time spent on studying the unit. It was found that differences between aptitude levels were increased rather than diminished when self-instrucional materials were used. While self-instructional materials facilitate retention for students of high and middle aptitude, the mastery procedures did not facilitate learning and retention for low-aptitude students. Greater learning was achieved by the middle aptitude students under the mastery treatment. The lack of differences between the low aptitude astery and non-mastery students is attributed to the lack of verbal facility that low aptitude students brought to instruction. Mastery student were found to use considerably more time in learning the material than did non-mastery students. The implications of these findings are discussed in relation to previous research and practical application.

76. Jones, F. Geoffrey. Mastery Learning and Geography: Effects upon Achievement, Retention, and Time-to-Completion. Paper presented at the annual meeting of the College and University Faculty of the National Council for the Social Studies (Chicago, Illinois, November 1974). 21 pages. ED 099 280.

This study compares self-instructional mastery and nonmastery treatments of a specially developed geography unit to determine if there were differences in learning, retention, and time-to-testing of high, middle, and low aptitude students. Mastery learning is an alternative which gives lower performing students the necessary additional time to learn while the progress of the higher aptitude student is retarded by withholding of additional learning tasks. Twenty grade 7 classes from Savannah-Chatham County School District, Georgia, were chosen as the experimental population. Mastery and nonmastery units were randomly assigned to classes in each school. Tests were administered to measure the students' learning and retention of the content materials. The results indicated that high and middle aptitude self-instructional mastery treatment students retained more than high and middle aptitude nonmastery students. Middle aptitude mastery students learned more than middle aptitude nonmastery students. There was no difference between learning and retention for low aptitude students across treatments. Therefore, the differences between aptitude levels were increased rather than diminished when self-instructional mastery units were used. The educational implications were that mastery treatment facilitated superior achievement at the price of less work covered in the time period, and that mastery treatment for low aptitude students could be effective only with close and careful teacher feedback instead of self-instruction.

77. Jones, Frank Geoffrey. The Effects of Mastery and Aptitude on Learning, Retention, and Time. Ed. D. Dissertation, University of Georgia, 1974. Also available from Geography Curriculum Project, Room 107, Dudley Hall, University of Georgia, Athens, Georgia 30602 ($5.00). 166 pages. ED 108 981.

The major purpose of this study was to compare self-instruction mastery and nonmastery treatments to determine if there are differences in learning, retention, and time-to-testing of high, middle, and low aptitude students. Twenty grade 7 classes from the Savannah-Chatham County School District served as the experimental population. Students were tested for placement in one of three levels of aptitude; then, classes were randomly assigned to two groups and treatment was randomly assigned to groups. The nonmastery treatment received a student text and a workbook which contained prescribed activities and a single review test for each chapter. The mastery treatment received the same student text; however, the chapters in the workbook contained two review tests. If the criterion level was not attained in the first review test, mastery students were required to correct and relearn material and then take a second review test. A multiple choice test and recall test were administered to measure learning and retention of the content materials. Findings showed that differences in aptitude were not reduced when self-instructional materials were used. An implication of this study is, however, that the lack of teacher monitoring in administering the review tests may have contributed to the poor performance of low aptitude students, since typically low aptitude students require close supervision.

78. Kim, Hogwon. Evaluation of the Mastery Learning Project in Korea. Studies in Educational Evaluation, Vol. 1, No. 1, Spring 1975, pages 13-22. EJ 131 784.

The instructional strategy for the promotion of mastery learning in Korean middle schools included educational diagnosis, compensatory programs, formative tests, remedial and enrichment programs, cooperative learning and summative tests. The Mastery Learning Project is seen as providing systematic and massive innovation efforts in the improvement of Korean education.

79. Kim, Hogwon. Mastery Learning in the Korean Middle Schools. Bulletin of the UNESCO Regional Office for Education in Asia, Vol. 6, No. 1, September 1971, pages 55-60. EJ 063 100.

The Korean Institute for Research in the Behavioral Sciences (KIRBS) has been systematically pursuing a long term research and development project in mastery learning with middle school students. The project

began in 1969 with a pilot study of about 270 students in a middle school in Seoul. It has been steadily expanded now to embrace about 50,000 students and 45 middle schools under its co-operative schools. Beginning from March, 1971, the project covers four subject-matter areas: Korean language, mathematics, sciences, and English, in the seventh and eighth grades. The present article discusses the theoretical background of mastery learning, instructional strategies used in the project, and the results obtained.

80. Kindschi, Douglas. Mastery Learning Model: A Pilot Study. Community College Frontiers, Vol. 3, No. 1, February 1974, pages 16-20. EJ 106 249.

This article reports the development of a mathematics course using the mastery learning model and a study of the relationship between learning rate and verbal and quantitative aptitudes.

81. King, Donald Thomas. An Instructional System for the Low-Achiever in Mathematics: A Formative Study. Ph.D. Dissertation, University of Wisconsin, 1972. 212 pages. ED 072 939. Available only from University Microfilms, 300 North Zeeb Road, Ann Arbor, Michigan 48106 (Order no. 72-13, 978. MF $4.00. HC $10.00.).

The purpose was to suggest improvements in the effectiveness of a unit on number theory designed to promote greater achievement and more positive attitudes toward mathematics for low achieving ninth grade students. Six classes were used. Three additive treatments were used with the materials: mastery learning; mastery learning and flow charting; and mastery learning, flow charting, and computer access. Results showed that all treatment groups displayed an over-all more positive attitude toward mathematics than the control group and showed significantly superior performance. Among the treatment groups, the mastery learning and flow charting group scored significantly higher than the other two.

82. King, Leslie A., and Szabo, Michael. Individualization of Physics for Increased Enrollment Through Modern Instructional Techniques. Science Teacher, Vol. 42, No. 4, April 1975, pages 36-37. EJ 116 634.

The Boyertown Area Senior High School project was established as a localized attempt to develop a physics program from an integration of several currently successful teaching strategies. The primary goals of the project were to increase physics enrollment, achievement, and interest by shifting the instructional strategies toward increasing degrees of individualization. Trained student assistants, behavioral objectives, progress level testing, and mastery learning were used to achieve an optimum degree of individualized physics instruction.

83. King, Leslie A., and Szabo, Michael. Individualization of Physics for Increased Enrollment Through Modern Instructional Techniques. Paper presented at the annual meeting of the National Science Teachers Association (22nd, Chicago, Illinois, March 1974). 16 pages. ED 093 669.

Presented is a description of a physics program format used, with a high degree of success, at Boyertown Area Senior High School in Pennsylvania. The program features integration of desirable curriculum innovations such as individualization with a recognized curriculum (Project Physics) while maintaining the quality of a solid first year physics course. The program utilizes trained student assistants, behavioral objectives, progress level testing, and mastery learning to achieve an optimum degree of individualized physics instruction.

84. Larkin, Jill H., and Brackett, George C. Mathematics Pre-Requisites: A Mastery Approach. American Journal of Physics, Vol. 42, No. 12, December 1974, pages 1089-1091. EJ 113 211.

A math review unit in a mastery-learning format is described. It was designed to ensure that every student entering a physics course could actually use the mathematics essential for the course.

85. Lawler, R. and others. Mastery Learning and Remedial Prescriptions in Computer Managed Instruction. Journal of Experimental Education, Vol. 43, No. 2, Winter 1974, pages 45-52. EJ 110 409.

Forty-one of 167 undergraduates in a health education course at Florida State University received traditional classroom instruction and served as a control group. The remaining students were randomly assigned to one of three treatment groups in a computer managed instruction learning environment. Students in all three groups were tested after each of the fourteen modules of the course. If students in the first group failed to reach criterion on a test, they were presented remedial prescriptions and allowed to repeat the test. Students in the second group were given remedial prescriptions, but were not permitted to repeat the test. The third group of students was given neither remedial prescriptions nor the opportunity to repeat the test. The results demonstrated a general superiority of the computer-managed instruction groups over the control group on final examination procedure, with the remedial prescription-forced mastery group achieving the greatest mean final examination scores.

86. Levin, Henry M. The Economic Implications of Mastery Learning. Occasional Papers in the Economics and Politics of Education. Stanford, California: Stanford University, School of Education, May 1973. Paper presented at the annual meeting of the American Educational Research Association (New Orleans, Louisiana, February 25 - March 1, 1973). 25 pages. ED 078 093.

An internal/external efficiency evaluation on the economic implications of mastery learning is presented. Two important aspects of mastery learning are: (1) its intrinsic worth regardless of economic benefits, and (2) the necessary changes in the social and economic structure that will make the mastery learning approach increasingly functional. It is pointed out that the mastery learning approach has a very humane quality in its concern with equalizing outcomes. There are important societal changes in the offing that will increase the functionality of this approach. It is concluded that the economic importance of the mastery-learning strategy will rise substantially over the foreseeable future.

87. Magidson, Errol M. Developing an Individualized Learning Course for an Urban Community College. Ed. D. Practicum, Nova University, July 1975. 37 pages. ED 110 131. Hard copy not available.

In inner city community colleges, problems of improving student achievement and enhancing positive attitudes toward learning are compounded by lack of adequate training in basic academic skills. A pilot project was undertaken at Kennedy-King College (Illinois) to assist instructors in developing individualized learning courses. Following a review of several instructional models, the investigator assisted a faculty member in developing an individualized learning module for a social science course, based on Herrscher's model of individualized instruction--a mastery learning approach. An evaluation form was devised to give a quantitative measure of the module's potential value along four dimensions: system (application of components of the learning model), approach (application of learning principles), format (presentation medium), and content (academic material). The module was revised on the basis of the evaluation results, and was presented to a social science class. Although student achievement on post-test scores did not meet expectations, 80 percent of the students rated highly their enjoyment of the learning experience.

88. Magidson, Errol. Mastery Learning and PLATO. Ed.D. Practicum, Nova University, December 1974. 49 pages. ED 100 435.

The objective of this practicum was to apply mastery learning principles in the development of a computer-based instruction lesson on "Divisibility Rules", which was designed for students preparing for

the General Education Development (GED) examination. This practicum sought to demonstrate that computer-based instruction which follows mastery learning principles facilitates student learning and fosters positive student attitudes toward learning. The lesson on "Divisibility Rules" follows a systematic approach to instruction that offers the student a rationale, objectives, pretest, alternative learning activities, and posttest with provision for revision. PLATO (Programmed Logic for Automatic Teaching Operations) is a computer-oriented instructional system that allows instructors to design individualized lessons for their students. The achievement results of the target group failed to measure up to the goal that 80 percent would achieve mastery. Technical difficulties hampered the results. The attitudinal results, however, were unanimously positive; this demonstrates that mastery learning strategies can provide students with enjoyable learning experiences.

89. Maginnity, Gerald F. A Personalized System of Instruction in Library Use. Monterrey, Mexico: Instituto Tecnologico de Monterrey, 1976. 14 pages. ED 125 530.

In response to a survey which showed library users to be deficient in research skills, the Technological Institute of Monterrey, Mexico, developed a programed course in library skills using the Personalized System of Instruction (PSI). The course structure featured mastery learning, self-pacing, student tutors, and emphasis on written materials. Each unit contained an introduction which attempted to motivate the student, followed by instructional objectives and materials, and evaluation. The elective course consisted of 12 units covering library resources, specialized sources in engineering and business administration, and research techniques which enabled the student to investigate topics in his own field of interest.

90. Mayo, Samuel T. Measurement in Education: Mastery Learning and Mastery Testing. Special Report, Vol 1, No. 3, 1970. East Lansing, Michigan: National Council on Measurement in Education, March 1970. 4 pages. ED 051 299. Hard copy available only from the National Council on Measurement in Education, Office of Evaluation Services, Michigan State University, East Lansing, Michigan 48823 ($10.25).

The historical background of mastery learning is discussed and related to the use of the traditional normal cure and to the nature of curves which express more adquately the mastery learning concept. It is suggested that the mastery model calls for strategies that: inform students about course expectations; set standards of mastery in advance; use short diagnostic tests for each unit of instruction; prescribe additional learning for those who do not demonstrate

initial mastery; and provide additional learning time for those who need it. These strategies for mastery learning and testing can benefit the student who experiences test anxiety. Suggestions for the construction of mastery tests include defining the objectives to be measured, items written to sample the content and behavior domains of those objectives, average item difficulty ranging from 85% or higher, and absolute performance interpretation. Proposals for the application by teachers of the principles suggested, techniques for test construction, test use, and grading, are presented.

91. McCollon, Kenneth A. Pre-professional Instruction in Engineering. Engineering Education, Vol. 64, No. 1, October 1973, pages 28-31. EJ 086 855.

The design principles and operations of a new program, Pre-professional Individually Paced Instruction (PIPI), are discussed, with emphasis on integrated curriculum planning, individually paced instruction, and mastery learning. Results indicated that students succeed better both in pre-professional courses and in follow-up engineering courses than in conventional courses.

92. Mechan, Merrill L. An Innovative Competency-Based Vocational Education Model Diffuses Itself. Journal of Industrial Teacher Education, Vol. 13, No. 2, Winter 1976, pages 34-44. EJ 135 685.

The Temporally Individualized Modular Education Scheduling (TIMES) project is an instructional delivery system reflecting the educational philosophy that each student be allowed to proceed at his/her own rate to his/her own level of competence, depending on both interest and ability. This paper reports on the competency-based, mastery learning approach of an inservice workshop held for an urban vocational-technical school faculty in which the TIMES project was taught for adoption purposes. After an evaluation of the workshop, results indicated that such a workshop can be an effective diffusion strategy for an educational innovation.

93. Meskauskas, John A. Evaluation Models for Criterion-Referenced Testing: Views Regarding Mastery and Standard-Setting. Review of Educational Research, Vol. 46, No. 1, Winter 1976, pages 133-158. EJ 138 794.

The adoption of a criterion-referenced approach to evaluation raises the issue of the definition of mastery. It can be described with a continuum model, where it is viewed as a continuously-distributed

ability or set of abilities; or it can be described with a state model, in which it is conceptualized as an all-or-none description of the student's learning state with respect to a specified content domain. Several examples of each of these models are reviewed, and their implications for mastery testing are discussed.

94. Morgan, Robert M. Mastery Learning and Programmed Instruction in Developing Countries. Educational Technology, Vol. 13, No. 10, October 1973, pages 25-28. EJ 087 923.

The implementation of a mastery learning strategy and programmed instruction techniques in Korea are described. It is suggested that these concepts would also facilitate the educational improvement efforts of other developing countries.

95. Mueller, Daniel J. Mastery Learning: Partly Boon, Partly Boondoggle. Teacher Education Forum; Vol. 3, No. 11. Bloomington: Indiana University, Division of Teacher Education, April 1975. 15 pages. ED 128 327.

Educational institutions have at least two major functions: education and certification of competency. This paper examines the educational strengths and limitations of the mastery learning instruction model with respect to fulfilling these functions. The components of the mastery model are contrasted with components of other instructional models, and their relative advantages and disadvantages discussed in the nine sections of the paper. Components of the mastery model are identified as: (1) formal specification of a comprehensive set of cognitive objectives; (2) instruction; (3) frequent formative diagnostic evaluation; (4) corrective or remedial instruction measures to remedy learning deficiencies identified in formative evaluation; and (5) criterion referenced summative evaluation. The advantage of mastery instruction is primarily its effectiveness for teaching basic skills and knowledge to slow learners and students who have not learned how to learn. Consequently, its optimal usefulness is in the elementary grades, especially the primary grades. The model reduces competition among students and reduces student failure and frustration. It is also effective with disadvantaged students and slow learners at all educational levels. The model does not do well when implemented in traditionally organized schools with time-fixed instructional units. It does not maximize learning for all students. However, the inclusion of an idea of mastery speed along with mastery certification would make mastery grades useful for educational and vocational decision-making.

96. Myers, Robert Reese. The Effects of Mastery and Aptitude on Achievement and Attitude in an Introductory College Geography Course. Ed.D. Dissertation, University of Georgia, 1975. 195 pages. ED 120 035. Available only from University Microfilms, P.O. Box 1764, Ann Arbor, Michigan 48106 (Order No. 76-6436, MF $10.00, HC $20.00).

This doctoral thesis annalyzes the effect of mastery and nonmastery teaching procedures upon student achievement and attitude in an introductory college-geography course. Mastery learning is the teaching strategy where each segment of materials must be mastered before instruction can begin on the next segment. A classroom lecture-discussion method was used to teach randomly selected students in a control class and a mastery-oriented class. Students in the mastery group were given the opportunity to attend tutorial sessions to be retaught the material that had not been answered correctly on formative tests. Findings indicate that there were no statistically significant differences between the control class and the mastery students in either achievement or attitude. However, the author believes that the tutorial session were more useful for low aptitude students.

97. Nation, Jack R., and Roop, Stephen S. A Comparison of Two Mastery Approaches to Teaching Introductory Psychology. Teaching of Psychology, Vol. 2, No. 3, October 1975, pages 108-111. EJ 126 898.

This research compares two popular mastery-based instructional programs: Programmed Student Achievement and Total Mastery Learning. The primary objective is to determine which mastery technique results in the best classroom performance of college students in an introductory psychology course.

98. Nowak, Mary Jane, and Stilwell, William E. Developmental Models for Accountability in Undergraduate Social Work Education, 1974. 22 pages. ED 115 149.

In an attempt to establish an empirical criterion base from which viable and valid decisions can be made regarding "what makes a good social worker" and "how do we know when we have a 'good' social worker", a mastery learning base is proposed which addresses itself to the change agent role of the social worker. A model is developed which consists of three conceptual areas: environmental influences, social work skills, and supportive skills, joined by feedback of evaluative accountability model for social work education. Fourteen construction areas can be refined into a number of elements, modules, or capsules of instruction. The focus is on the latter two conceptual areas, social work skills and supportive skills. Accountability in

social work education is not an alternative but a societal demand. The worth of this model will only be determined by its implementation in the real world. Its degree of success may provide valuable information for change in social work education.

99. Okey, James R. Altering Teacher and Pupil Behavior with Mastery Teaching. School Science and Mathematics, Vol. 74, No. 6, October 1974, pages 530-535. EJ 106 400.

This study's main purpose was to determine the effects a mastery teaching strategy would have on pupil achievement. A total of 21 teachers participated; results are reported for the subgroup of third and fourth grade teachers (n=5). Achievement of pupils favored the mastery group for each of the teachers.

100. Okey, James R. The Consequences of Training Teachers to Use Mastery Learning. Washington D.C.: Office of Education (DHEW), Teacher Corps. Paper presented at the annual meeting of the American Educational Research Association (San Francisco, California, April 19-23, 1976). 16 pages. ED 120 169.

The purpose of this project was to produce materials that would foster favorable teacher attitudes toward the philosophy behind mastery learning. One other purpose was to help teachers acquire the skills needed to use mastery learning in their classrooms and to determine the effects on pupils when mastery learning techniques were used. Forty-four teachers and interns from four Indianapolis schools were equally divided into groups according to race and sex. The material developed was a Mastery Teaching module which included an introduction and six sections. A slide/tape accompanied each of the seven parts. An accompanying manual contained objectives, practice exercises, and feedback. The manual also included self-tests with answers for each section, a pre-test on prerequisites, and a project section. Pre- and post-treatment measures were administered to the teachers and interns on both cognitive and affective variables. The results indicated that teachers and interns acquired the mastery teaching skills and used them to the degree that pupils perceived differences in their teaching. Teacher attitudes toward the mastery teaching philosophy were generally positive, and students' attitudes and achievement were favorably altered because of their teachers' use of mastery teaching.

101. Olson, Thomas A. Graduation Requirements as a Vehicle for Change. Paper presented at the annual meeting of the American Educational Research Association (Washington, D.C., March 30-April 3, 1975). 9 pages. ED 108 394.

The revised Oregon high school graduation requirements, adopted in 1972, are an attempt to respond to attacks on the schools and to clarify the purposes of schooling. The uniqueness of the Oregon approach lies in the mechanism for bringing about change in the schools--a radically revised set of requirements for high school graduation. The focus of the revised graduation requirements is on identification and student achievement of minimum survival competencies in three broad areas: personal development, social responsibility, and career development. The initial focus on specifying, developing, and evaluating pupil competencies provides an opportunity to consider the support and resource needs of the schools as they design and implement mastery learning strategies. The competency-based learning strategies will focus on the specification of competencies, the design and implementation of continuous feedback evaluation systems as students move through the learning experiences, and the summative certification of achievement of the competencies. Research and development related to these issues can improve the knowledge base and provide direction to other states and local education agencies as they seek to bring about reform through the competencies approach.

102. Pfaff, Judy K., and Schmidt, William H. Mastery Learning Strategies Applied to the Teaching of Statistics. Paper presented at the annual meeting of the American Educational Research Association (Chicago, Illinois, April 15-19, 1974). 17 pages. ED 097 357.

The purpose of this study was to describe and compare the performances of students in a beginning course in educational statistics. Modified mastery learning strategies such as the use of a pretest, diagnostic tests, parallel midterms, and an extended time allowance to master the content were employed during the course. Data was available on 359 graduate students over a 2-year period. The results of this non-experimental study support the usefulness of the pretest; show that grades improve when more diagnostic tests are taken; scores almost always increase with the second parallel midterm; increased time is accompanied by decreased performance; masters students always do better than doctoral students; and the classes in which the mastery strategies were used were about the same overall as previous classes.

103. Proger, Barton B. Test Review No. 78: Woodcock Reading Mastery Tests. Journal of Special Education, Vol. 9, No. 4, Winter 1975, pages 439-444. EJ 136 196.

The Woodcock Reading Mastery Test (WRMT), a criterion-referenced measure, is reviewed. It includes five subtests: Letter Identification, Word Identification, Word Attack, Word Comprehension, and Passage Comprehension;

and is an individually administered, hand-scored test for grades K through 12. The Mastery Scale of the WRMT, based on Rasch's model, not only gives a child's degree of mastery, but also the predicted degrees of mastery on harder and easier material.

104. Reichman, Susan L., and Oosterhof, Albert C. Strategy Guidelines for the Construction of Mastery Tests. Paper presented at the annual meeting of the American Educational Research Association (San Francisco, California, April 19-23, 1976). 26 pages. ED 126 103.

Various procedures and guidelines have been suggested for the development and construction of criterion-referenced tests. The present paper proposes a comprehensive model which allows the user to identify and relate specific components which affect the optimal construction and implementation strategies of criterion-referenced tests. Futhermore, it establishes parameter values which will allow the classification of individuals into mastery or nonmastery states with prespecified levels of confidence. Although the discussed model incorporates binomial expansions, it uses parameters of selected items for establishing baseline probabilities instead of true scores derived from an assumed population of items.

105. Reynolds, Carl H., and Gentile, J. Ronald. Performance Under Traditional and Mastery Assessment Procedures in Relation to Students' Locus of Control: A Possible Aptitude by Treatment Interaction. 12 pages. ED 103 357.

Previous research in locus of control (LC) suggested the hypothesis that internal subjects should perform better under mastery than under traditional assessment procedures, while the reverse should be true of externals. Two experiments were conducted using undergraduate and graduate subjects. Neither the LC nor the assessment procedure main effects were significant in either study, and no interaction was found with the undergraduates. With graduate subjects there was a significant interaction opposite mastery procedures. These results are harmful to the construct validity of the I-E Scale (Rotter, 1966) and supportive of the mastery learning approach.

106. Rice, Marion J. Variables in Mastery Learning: Is a Mastery Learning Model Appropriate to the Social Studies? Paper presented at the annual meeting of the American Educational Research Association (San Francisco, California, April 19-23, 1976). 19 pages. ED 124 463. Hard copy not available.

Designed as an introduction to a symposium on the appropriateness of mastery learning as a technique of social studies instruction, this

paper reviews research on the variables related to mastery learning in order to provide a basis for systematic symposium discussion. Brief research reviews are included on the following variables: materials, instructional procedures, criteria for mastery, teacher characteristics, pupil characteristics, classroom environment, duration of mastery sequence, and management problems. Appendix A contains a more extensive list of variables for further discussion, and Appendix B indicates a hypothetical and cumulative research sequence which is necessary to establish a body of reliable knowledge about mastery learning. Brief reviews of the four research studies which were presented at the symposium are included in Appendix C. A bibliography of related research on mastery learning is also included.

107. Riviere, Michael S., and Haladyna, Thomas H. Effects of Learner Variables on Retention and Two Levels of Cognitive Material When Learning for Mastery. Paper presented at the annual meeting of the American Educational Research Association (Chicago, Illinois, April 15-19, 1974). 20 pages. ED 100 976. Hard copy not available.

Several tenets of mastery learning were examined in this study in the context of college level instruction. When students learn for mastery: (1) retention test scores should exhibit small variability and should be unrelated to aptitude; (2) test items which are classified into high and low cognitive behavior subscales should be unrelated to aptitude. The first tenet was partially supported as the relationship between retention and aptitude was uniformly low across three units of instruction, and variability of retention test was not restricted. No relationship between performance on both high and low cognitive subscales and aptitude was observed.

108. Romberg, Thomas A., and Shepler, Jack. Retention of Probability Concepts: A Pilot Study into the Effects of Mastery Learning with Sixth-Grade Students. Journal for Research in Mathematics Education, Vol. 4, No. 1, January 1973, pages 26-32. EJ 068 641.

A mastery learning strategy was used to teach probability and statistics concepts to sixth-grade students. Tests were given after instruction and four weeks later. Correlation between achievement scores for each student was .78. Retention ratios for individuals, total tests, each objective, and each item indicated high initial performance may contribute to high retention.

109. Roueche, John E. Can Mastery Learning Be Humane? The Case for Performance-Based Instruction. Community College Review, Vol. 3, No. 1, June 1975, pages 14-21. EJ 119 758.

Mastery learning has been called cold and impersonal. On the contrary, it is humane because it allows for individual differences, emphasizes each student's ability to master the subject at hand, and provides honest and open communication between students and instructors.

110. Russell, James D. The Way You Always Wanted to Teach--But Were Afraid to Try. Educational Technology, Vol. 15, No. 6, June 1975, pages 9-13. EJ 139 669.

The introductory instructional technology course at Purdue University represents a practical application of modular instruction, stated performance objectives, a multimedia approach to learning and mastery evaluation. The instructional modules are designed from a list of objectives and student projects. Students progress at their own rate toward mastery and are provided with a variety of learning activities and evaluation techniques. A mastery approach to evaluation is employed. The student selects from a variety of evaluation techniques, such as written quizzes, oral examinations, demonstrations and projects. He may re-test on any module he has failed to master. As a consequence of using objectives, a variety of learning strategies, self-pacing and diagnostic evaluation, over 75 percent of the students demonstrate mastery of 90 percent of the course content.

111. Sanderson, Herbert W. Student Attitudes and Willingness to Spend Time in Unit Mastery Learning. Research in the Teaching of English, Vol. 10, No. 2, Autumn 1976, pages 191-198. EJ 144 489.

The purpose of this study was to test the hypothesis that student satisfaction with mastery learning and the extent to which students see themselves as personally involved in the instructional process, together with general school satisfaction, would significantly predict the amount of time spent in learning in a mastery-taught English course organized into discreet components or units at the tenth grade level.

112. Schechtman, Gilbert. Mastery Learning at Olive-Harvey College. Paper presented at the annual meeting of the Conference on College Composition and Communication (St. Louis, Missouri, March 13-15, 1975). 7 pages. ED 109 677.

Mastery Learning, a learning strategy which denies the inevitability of the normal grading curve, holds promise in skill-building courses. For a composition course using this strategy, course objective must first be established and stated behaviorally, after which the course may be broken into learning units, each lasting perhaps two weeks.

At the end of a two-week instruction period, students take a formative or diagnostic test--one of the defining features of Mastery Learning. Students not passing the test are directed to another defining feature, corrective learning experiences. Unit subjects may be divided into such units as manuscript matters, content, and the mechanics of writing. This strategy recognizes the potential of students as being unlimited and introduces system, measurement, and self-evaluation into education.

113. Sharples, D. Kent, and others. Self-Paced Learning in Civil Engineering Technology: An Approach to Mastery. Columbia, South Carolina: South Carolina State Board for Technical and Comprehensive Education, 1976. Report presented at the annual meeting of the American Association of Engineering Education (Nashville, Tennessee, June 15, 1976). 14 pages. ED 121 365. Hard copy not available.

This document records the procedures followed by the South Carolina State Board for Technical and Comprehensive Education in developing a two-year curriculum for civil engineering technology with a learner-oriented, open-entry/open-ended individualized format relying heavily on the use of audiovisual aids and hands-on experience with software and equipment. The basic format for each course is a combination of written modules that form a linear progression through a series of related objectives. The linear progression of written material is broadened by a series of alternate media developed to be used at different points in the curriculum. The faculty in the 10 South Carolina institutions which currently offer the Civil Engineering Technology program were organized to form a nucleus of course content experts. This faculty group identified 11 courses which should be included in the new program and put into the new format. Course objectives were identified, and a collective list of 163 competencies to be required of program graduates was compiled. Individual community college faculty were hired to write the individual courses, with the University of South Carolina faculty serving as consultants. When the writing of each course was completed, it was validated by field test.

114. Sheldon, M. Stephen, and Miller, E.D. Behavioral Objectives and Mastery Learning Applied to Two Areas of Junior College Instruction. Los Angeles, California: University of California at Los Angeles, 1973. 90 pages. ED 082 730.

Mastery learning is an approach to learning whereby students are expected to demonstrate competence of one level, or unit, of learning objectives before advancing to the next level. Most junior college instruction is group-paced, with the instructor determining the rate at which units are presented. One compromise between existing instruction and ideal mastery

learning techniques is to provide specific supplementary instruction for those students who fail to master a given unit, while maintaining the group pace. The research reported focused on one form of that compromise: the effect of teaching one additional lesson per unit to those students who did not achieve mastery of that unit. Another part of the research examined the effect of providing students with detailed behavioral objectives. The research was conducted in selected English and algebra courses at five community colleges in Southern California. Dependent variables were scores on semester exam and mastery rates, as defined by the proportion of the number of students who received A's, B's, and C's to the total number enrolled. The results of the research are reported separately for the English and algebra classes. In the algebra classes, the students received testing and remediation for mastery, and they achieved significantly higher final exam scores than control students. There was no significant difference between mastery rates of experimental and control stuents. In the English classes, the students who received detailed behavioral objectives scored significantly higher on their final exam than did control subjects who did not receive the objectives.

115. Shepler, Jack Lee. Parts of a Systems Approach t/ the Development of a Unit in Probability and Statistics for the Elementary School. Journal for Research in Mathematics Education, Vol. 1, No. 4, November 1970, pages 197-205. EJ 039 002.

The purposes of this study were twofold: (1) to test the feasibility of teaching topics in probability and statistics to a class of sixth-grade students; and (2) to construct a set of instructional materials and procedures in probability and statistics for sixth-grade students. After a task analysis of the content area, behavioral objectives were identified and ordered. A mastery learning strategy, based on that of Bloom, was used to implement the program. Results indicate that, under ideal conditions, probability and statistics can be taught at the sixth-grade level. Suggestions for future research are discussed.

116. Sherman, J.G., ed. Personalized System of Instruction Newsletter, Number 8. Washington, D.C.: Georgetown University, Dept. of Psychology, April 1973. Also available from Personalized System of Instruction Newsletter, Psychology Department, Georgetown University, Washington, D.C. 20007 (Free). 12 pages. ED 079 208.

The purpose of this quarterly newsletter is to provide information, communication, and exchange of ideas between people offering Personalized System of Instruction (PSI) courses. The instructional system, an alternative to the traditional university-college lecture-recitation method of teaching, emphasizes a personalized, self-paced, mastery

learning with undergraduate tutors. In this issue three authors place PSI in a context relative to the current education scene, relating the system to other innovations and identifying its problems, weaknesses, and strength. The newsletter is free to those who wish to have their name placed on the mailing list.

117. Sherman, Lawrence William. Comparison of Two Instructional Procedures in Introductory Educational Psychology Classes. Paper presented at the annual meeting of the American Psychological Association (Chicago, Illinois, September 1975). 22 pages. ED 114 322.

Innovations which were incorporated into large, introductory, educational psychology lecture classes are described and compared to smaller classes that did not make use of the innovations. Four innovative pedagogical techniques are used: (1) a mastery approach, (2) formative evaluation, (3) a modified pyramid-like structure using small group discussion leaders, and (4) supplemental readings. Posttest data from two large lecture classes using these innovations are contrasted with posttest data from the smaller class that did not use them. The results of the posttest and a survey of students' opinions of the innovations indicate that large lecture classes do not have to be a negative educational experience for undergraduate college students. From both a cognitive and affective point of view, students gain more knowledge and prefer the experience of a large class if it is structured in this appropriate manner. Making use of formative evaluation, small group meetings, discussion leaders, supplemental readings, and the mastery approach can efficiently achieve educational goals and enhance the student's experience in a large class structure.

118. Skaalvik, Einar M. An Evaluation of Mastery Learning. Scandinavian Journal of Educational Research, Vol. 19, No. 2, 1975, pages 59-74. EJ 122 072.

Mastery learning is a teaching strategy that originates from behavior-oriented educational technology and objectives are specified in behavioral terms. It presupposes a hierarchically-structured subject matter and a quantitive definition of mental capacity. Further, it is based on the assumption that aptitude-treatment-interactions can be found and that it is possible to base an educational system upon such interactions. These assumptions are found not to be valid, and behavioral criteria of mastery are not consistent with important attitude formation. Both mastery learning and educational technology in general are therefore discussed on the basis of a cognitive psychology.

119. Smith, Jeffrey K., and Wick, John W. Practical Problems of Attempting to Implement a Mastery Learning Program in a Large City School System. Paper presented at the annual meeting of the American Educational Research Association (San Francisco, California, April 19-23, 1976). 18 pages. ED 123 563.

Low reading achievement in the Chicago public schools spurred the development of a mastery approach reading package. This approach assumes that in time any student can achieve the level of the brightest student. Implementation of a mastery program in urban areas presents special problems, including diversity of student backgrounds, time and space limitations, and varying degrees of teacher expertise. The instructional materials of the Chicago mastery reading package consist of four elements: skills units, comprehension units, enrichment activities and basal readers. Teacher training, classroom management, and record keeping procedures were developed during the first year of program implementation. Although all data has not yet been collected, it has become increasingly apparent that reading instruction can be adapted to the mastery learning framework and utilized in a large city school system.

120. Steinheiser, Frederick H., Jr. A Bayesian Simulation for Determining Mastery Classification Accuracy. Paper presented at the annual meeting of the American Educational Research Association (San Francisco, California, April 19-23, 1976). 10 pages. ED 124 596.

A computer simulation of Bayes' Theorem was conducted in order to determine the probability that an examinee was a master conditional upon his test score. The inputs were: number of mastery states assumed, test length, prior expectation of masters in the examinee population, and conditional probability of a master getting a randomly selected test item correct, and of getting an item incorrect. Classification accuracy was shown to be a function of all of the above parameters for any specified level of mastery (in the criterion-referenced sense). Specific results showed that for some combinations of prior information and test length, no information from the test could force a reversal in the decision rule, or provide classification accuracy within acceptable error bounds; hence, tests results would be irrelevant. The vulnerability of a Bayesian model to changes in the prior probabilities was also demonstrated. For example, a 10% change in conditional probability was sufficient to completely reverse a classification rule across all test lengths studied when the prior probability was held constant. Less drastic shifts occurred with changes in the prior probabilites.

121. Subkoviak, Michael J. Estimating Reliability from a Single Administration of a Mastery Test. Paper presented at the annual meeting of the American Educational Research Association (San Francisco, California, April 19-23, 1976). 23 pages. Ed 120 229.

A number of different definitions and indices of reliability for mastery tests have recently been proposed in an attempt to cope with possible lack of score variability that attenuates traditional coefficients. One promising index that has been suggested is the proportion of students in a group that are consistently assigned to the same mastery state across two testings. The present paper proposes a single test administration method of obtaining such an estimate.

122. Survey of Exemplary Instructional Practices. Salt Lake City: University of Utah, Bureau of Educational Research, June 1971. Also available from Educational Progress Reports, Editor, Bureau of Educational Research, 308 W. Milton Bennion Hall, University of Utah, Salt Lake City, Utah 84112. 11 pages. ED 055 058.

Based on structured interviews with 92 faculty members in ten departments at the University of Utah, a categorized list of innovative teaching practices was compiled. The list was separated into two major divisions. The first division deals with in-class learning materials and activities. Within this grouping there are 15 categories, mastery learning among them. The second major division--learning experiences provided largely outside the classroom--includes three categories: developing the student's research skills, "immersion" techniques, and field work. Each practice described is identified by instructor and course.

123. Szabo, Michael, and Bell, Paul E. An Experimental Science Methods Course: Simulation of Realistic Classroom Functions. University Park: Pennsylvania State University, March 1971. Paper presented at the annual meeting of the National Science Teachers Association (Washington, D.C., March 1971). 12 pages. ED 058 148.

The methods course presently in operation at Pennsylvania State University is organized around the achievement of performance criteria following a mastery learning model. Although conditions for demonstrating competency are specified by the instructors, students select the means for developing the competencies and follow their own schedule by completing formal learning contracts. This arrangement is called Structured Independent Study. The most exacting requirement demands that the student videotape, code, and critique two teaching performances in terms of prescribed teaching behaviors. Coding is accomplished with the Social Substantive Schedule, which assesses the congruence between a specified instructional mode and a teacher's verbal behavior. Preliminary results from comparing students in the experimental course with students in a traditional course indicate that although typical measures of course achievement did not discriminate between groups, experimental students spent significantly less time on the course and conferred with the instructor significantly more often than traditional students. Students rated the videotape evaluation as the most valuable course activity.

124. Taylor, Susan S. The Effects of Mastery, Adaptive Mastery, and Non-Mastery Models on the Learning of a Mathematical Task. Paper presented at the annual meeting of the American Educational Research Association (Washington, D.C., March 30 - April 3, 1975). 48 pages. ED 106 145.

Three learning models (adaptive mastery, typical mastery, and traditional non-mastery learning models) which employed different criteria for terminating computer-based practice in order to determine mastery or non-mastery of arithmetic skills were compared. The efficiency of two different sequencing arrangements (mixed and clustered) of practice items was also examined. All treatments involved the teaching of basic arithmetic skills to seventh-grade students. The adaptive mastery learning model produced the same high level of performance on both the posttest and a delayed retention tests as the other two models, but requires less time, fewer practice items, and minimized overpractice. No significant differences were found between the clustered and mixed item arrangements.

125. Taylor, Thomas E. Directed Study Time: One Element of an Experimental Procedure for Science Teaching. Journal of College Science Teaching, Vol. 5, No. 5, May 1976, pages 320-322. EJ 143 492.

The administrative procedure for a general chemistry program involving small groups of students working together toward the mastery of performance objectives is described; and an evaluation in terms of professor time, student attitude, and student achievement is provided.

126. Thrash, Susan K., and Hapkiewicz, Walter G. Student Characteristics Associated with Success in a Mastery Learning Strategy. Paper presented at the annual meeting of the American Education Research Association (New Orleans, Louisiana, February 25 - March 1, 1973). 9 pages. ED 074 388.

This paper examines student characteristics associated with success in a mastery learning strategy by: (1) continually assessing over terms the entry and exit skills of the students enrolled and (2) constructing and validating a scale for measurement in the affective domain. The mastery learning theory itself was proposed by Bloom (1968) as a method of individualized instruction. Subjects for the study were graduate and undergraduate students in educational psychology who progressed through a series of six units requiring mastery tests upon completion. While preassessment data showed substantial individual differences among students' knowledge of educational psychology, mastery learning theory suggests that such student differences may simply mean that different amounts of time are required to learn a task. Analysis of the data

reveals that males generally reacted more favorably than females to the mastery learning technique and also that graduate students, who were primarily practicing teachers, rated the course less favorably than did undergraduate students.

127. Tillman, Murray H. Formative Exercise T-TE-15A. Formative Exercise T-TE-15B. Journal of Educational Measurement, Vol. 11, No. 3. February 1974, pages 220-222. EJ 105 051.

Two testing packets, Formative Exercises T-TE-15A and T-TE-15B are reviewed. The Exercises are based on Bloom's concept of learning for mastery and are designed to acquaint teachers with the principles of mastery learning and provide examples of formative evaluation. One form of the exercises provides instant feedback to the examinee; the other provides response-contingent corrective feedback.

128. Wagner, John, and Jones, Howard. Group-Based Instruction: The Best Chance for Success? Two-Year College Mathematics Journal, Vol. 4, No. 1, Winter 1973, pages 51-54. EJ 071 811.

On the basis of research findings, it is suggested that flexible time scheduling and mastery learning strategies should be more widely applied.

129. Wang, Margaret, and Lindvall, C.M. An Exploratory Investigation of the Carroll Learning Model and the Bloom Strategy for Mastery Learning. Pittsburgh, Pennsylvania: Pittsburgh University, Learning Research and Development Center. Paper presented at the annual meeting of the American Educational Research Asociation (Los Angeles, California, February 5-8, 1969). 15 pages. ED 028 841.

A group of students normally distributed in aptitude and given the same instruction will produce a normal distribution of student achievement. It has been contended that if each of five primary variables in learning are optimized for each student, all students should be expected to achieve mastery of the material. These variables are (1) aptitude of student, (2) quality of instruction, (3) ability to understand instruction, (4) perserverance, and (5) time allowed for learning. This study investigated this hypothesis with an individualized learning program (ILP), in which all students were supposed to attain mastery on each lesson before going on in the program. Students in grades two through six were given aptitude tests, and their performance in the ILP was compared with the test results. Little relationship between rate of learning and aptitude was found when variables number two, three, and four were ignored or were assumed to be operating at an optimum level

for all. Thus, either the variables should not have been ignored or the experimental design in this study was faulty. Aptitude may still be found to be the most important factor in rate of learning.

130. Wang, Margaret C., and Lindvall, C.M. An Exploratory Investigation of the Carroll Learning Model and the Bloom Strategy for Mastery Learning. Pittsburgh, Pennsylvania: Pittsburgh University, Learning Research and Development Center, 1970. 17 pages. ED 054 983.

The purpose of this paper is to report on a pilot investigation of the operation of the Bloom and Carroll hypothesis which states that aptitudes are predictive of rate of learning given a situation in which the time allowed for learning is unlimited, and pupil perserverance, ability to understand instruction, and quality of instruction are optimized for each student. Data for this study were obtained for six separate samples of elementary school students in the individually prescribed instruction project from grades 2 through 6 studying in six different units in arithmetic; sample size varied from 42 to 182. The analyses were carried out in three steps: 1) the correlation between aptitude and rate of learning using two measures: previous year rate of learning, and non verbal I.Q. using Lorge-Thorndike; 2) examination of the effectiveness of each aptitude measure as predictors of a composite rate measure; and 3) examination of the other variables using the two measures in step one plus aptitude measures of mathematics achievement using the Stanford Achievement Tests and Lorge-Thorndike. Multiple regression analysis was used to investigate the composite contribution of these measures of Carroll's variables to each of the four learning rate measures. The three analyses substantiated the hypothesis that there is no simple relationship between pupil aptitude and rate of learning.

131. Warries, Egbert. Standard Mastery Curves and Skew Curves. Paper presented at the annual meeting of the American Educational Research Association (Chicago, Illinois, April 15-19, 1974). 18 pages. ED 091 422.

The objective of the study is to convince educational researchers of the necessity for "standard mastery curves" for the graphical representation of scores on summative tests for a group of students. Attention is drawn to the study of theoretical and empirical skew curves in education and biology. Use of standard mastery curves and study of skew curves in statistics and biology is in consequence with the basic idea of mastery learning. It seems to fill the gap between felt pressure to reach mastery and the relative measurement devices available.

132. Welser, John R., and others. Mastery Learning, Minicourses and Multimedia Instruction in Anatomy. Journal of Biocommunication, Vol. 1, No. 2, November 1974, pages 8-15. EJ 109 095.

A model of instruction combining the concepts of learning for mastery, minicourses and multimedia instruction was tested in a comparative veterinary anatomy course. The course, subdivided into twelve minicourses, was taught utilizing multimedia instruction. Student flexibility was permitted in choice of learning experiences and time of evaluation. To complete each minicourse, the student had to attain a mastery level of 90 percent on objectives selected at random. Significant improvements were made in the affective domain with no loss in the cognitive level. This developed model brought about an increase in student confidence, attitude and motivation. The instructors and students felt learning for mastery and minicourses resulted in more accurate certification of the student's ability, while multimedia instruction permitted greater flexibility in learning.

133. Wentling, Tim L. Mastery Versus Nonmastery Instruction with Varying Test Item Feedback Treatments. Journal of Educational Psychology, Vol. 65, No. 1, August 1973, pages 50-58. EJ 083 577.

The present study sought to investigate the outcomes of the mastery instruction approach compared to a nonmastery approach of instruction with varying amounts of feedback being given to students with regard to their responses to multiple-choice test items on mastery tests. The mastery strategy was found to be superior in terms of immediate and delayed achievements, but students required 50 percent more time to complete instructions with no difference in attitude. A mastery strategy with partial item feedback appears most desirable when the time trade-off is justifiable.

134. Wentling, Tim L. The Utilization of Mastery Learning in Vocational Education: An Empirical Study. Journal of Industrial Teacher Education, Vol. 10, No. 4, Summer 1973, pages 36-45. EJ 081 550.

One hundred sixteen male high school students were distributed among six classes on "General Automobile Mechanics." A text on automobile ignition systems was revised and broken down into eight units. All students were allowed to work at their own pace. The treatment groups were allowed to retake each unit test up to three times, with specific review assigned; while the control group took each unit test and was graded. The mastery learning strategy precipitated superior mean achievement scores for both immediate achievement and retention, and the knowledge of correctness of response raised the subject's attitude toward instruction, but the amount of time spent on instruction was 50 percent greater for the mastery strategy.

135. Yeazell, Mary I., and others. Self-pacing and Procrastination in Mastery Learning. Educational Research and Methods, Vol. 8, No. 1, 1975, pages 5-8. EJ 139 977.

A self-paced section and a teacher-paced section of an undergraduate educational psychology course were studied. By asessing the number of trials to criterion, the investigators concluded that the self-paced method was more effective.

136. Yonke, Annette, and Olsen, George E. The Johnson School Study: Status of the Continous Progress Program of Reading at Johnson Elementary School After One Year of Implementation (Fall 1974 - Spring 1975). Technical Report. Chicago, Illinois: Roosevelt University, College of Education, 1975. 64 pages. ED 119 106.

This study reports the results of a year long investigation conducted by the Research and Development Center of Roosevelt University, College of Education. The study was designed as an inquiry into the first year of a school system's attempt to implement a program of continuous progess for inner--city elementary school students in the city of Chicago. The Continous Progress Program (CPP) employs the concepts of mastery learning in an individualized instructional setting, based on the following concepts: learning is continous: skills tailored to the individuals' needs: and each child must have opportunities to experience success. The eight chapters examine such topics as teachers' attitudes toward change; teachers' perceptions of CPP; administrators' perceptions of CPP; differences between key informant teachers' perceptions of CPP in five categories; classroom management of CPP; individual instruction at Johnson school; and the conclusions and both recommendations of this study. At the time of this evaluation, both classroom observations and teacher and administrator interview revealed the state of implementation to be quite low.

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